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Guest Editors for Issue in Honor of Clarence Ward

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Dedication

We, the undersigned, speaking on behalf of the whole staff of the Department of Fine Arts at Oberlin College, wish to express our deep appreciation to the *Journal of the Society of Architectural Historians* and, in particular, to its editors, Mr. Alan K. Laing and Mr. Edwin Rae, for being given the opportunity to pay this tribute to our friend and colleague.

Clarence Ward came to Oberlin after having received his education at Princeton University (A.B., 1905; Ph.D., 1914) and after having taught architecture at Rutgers University from 1908 to 1916. ~~Thus, he is completing~~ his ~~thirty-third~~ year 1916 and served as lecturer in architecture at Princeton from 1909 to 1916. Thus, he is completing his thirty-third year of service to Oberlin College as teacher and scholar, administrator, museum director, and architect.

As a *teacher and scholar,* Clarence Ward has always combined enthusiasm with objectivity of approach. In his special field, the history of architecture, his teaching has been based on extensive travels and unstinted research which has also resulted in a number of important contributions to that field. It is here that his influence has reached far beyond Oberlin. In addition to lectureships held at Princeton, Columbia, and Chicago Universities, he has lectured widely for the Archaeological Institute of America. He has largely contributed to the objectives of the Society of Architectural Historians. He has generously put at the disposal of many writers, scholars, and lecturers the magnificent photographs which he, together with Arthur Princehorn, took in France and for which he is just now being honored with an exhibition at the National Gallery of Art in Washington. A measure of the enthusiasm for architectural research which he engendered in many of his students can be gained by the perusal of the summaries of Oberlin Master's Theses printed farther back in this issue; they include many topics from American architecture in which field his knowledge is supreme. Also in this issue are found summaries of some lectures given at the memorable symposium on medieval architecture which was held in Oberlin last October, one of several noteworthy gatherings of this kind.

As an *administrator,* Clarence Ward has made the Department of Fine Arts of Oberlin College a focus of admiration (and envy) throughout the country. In it, the history and the practice of art live in a happy symbiosis without intruding upon each other's particularities. Its library provides facilities for extensive research in all fields of art history; its collection of slides is one of the largest in the country; its technical equipment is the unfailing subject of amazement and awe-struck comment on the part of every visitor. All this has been achieved without impairing that variety of interests and individual teaching methods in the Department without which all administrative work must defeat its own purpose.

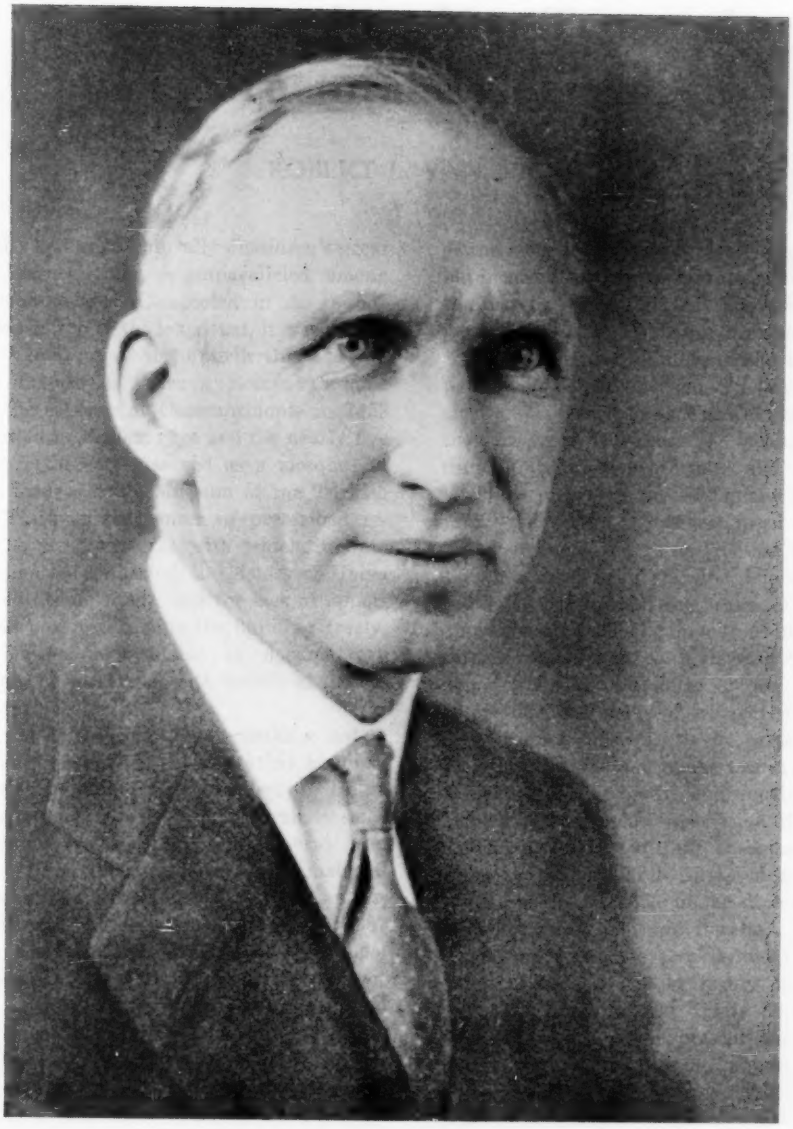
As a *museum director,* Clarence Ward has put Oberlin in the forefront of American colleges. Inspired by him, great patrons such as Dr. D. P. Allen, Mrs. E. Prentiss, and Mr. R. T. Miller, Jr., have provided the means for the foundation and growth of an art collection which during his stay in Oberlin has developed from an accumulation of casts and bric-a-bracs to a well-rounded college museum of very considerable rank. Its excellent display, accomplished in spite of heavy odds, owes much to his painstaking practical advice and design down to the smallest detail.

As an *architect,* Clarence Ward has not only personally designed the building and equipment of the annex which houses the Department proper, but also contributed substantially to the cause of good architecture in and around Oberlin by designing private houses and, in particular, by building and re-building churches, including the one in which he himself has found the time and energy to serve as a minister for many years.

We hope to have sketched the activities and achievements of Clarence Ward with the objectivity which befits a man of his stature and of his uncompromising aversion to big words, and we trust that the reader will not conclude from this presentation that our feelings are not involved as we sum up the record of the man. But the record of this man has little to do with retrospection. To him, his work is a beginning; and new work is also beginning for him. Quod felix faustumque sit!

WOLFGANG STECHOW
EDWARD CAPPS, JR.

DEPARTMENT OF FINE ARTS,
OBERLIN COLLEGE



CLARENCE WARD

Hagia Sophia: New Types of Structural Evidence*

ROBERT L. VAN NICE

Historically and architecturally Justinian's great church of Hagia Sophia is unparalleled among mediaeval monuments. Completed in A. D. 537 and dedicated to the Orthodox ritual, it was sacked in 1204 by Venetians of the Fourth Crusade and became for fifty-seven years a Roman Catholic church; at the capture of Constantinople in 1453 it was converted to Moslem rites and for nearly five hundred years thereafter served as a mosque; in 1935 it was made a State Museum of the Turkish Republic. Thus, as the center of prescribed religions of the three empires with which its fate has been intimately connected, the history of Hagia Sophia is well documented. But for lack of opportunity in the past to examine the building freely, what information is available in documentary sources cannot be correlated with details of the existing structure.

The purpose of the following remarks is not to attempt a solution of any of the varied architectural problems inherent in, or ascribed to, Hagia Sophia; it is to explain briefly and informally some types of evidence which have not hitherto been brought to bear on these problems. The material presented herewith was assembled during an extended structural investigation initiated in 1937 by William Emerson, former Dean of the School of Architecture at the Massachusetts Institute of Technology, sustained and supervised by him, and aimed at identifying the original form of Hagia Sophia at the time of its completion in A. D. 537. In a strict sense this has not been an archaeological undertaking, for it involves neither excavation nor re-examination of documents. On the other hand it has the advantage, thanks to the friendly collaboration of scientists at M.I.T., of offering data interpreted according to the most advanced technical knowledge of the moment. Before describing some of the more interesting types of evidence and their implications, it may be useful to review in general the reasons which establish Hagia Sophia as a key monument in the history of architecture.

This vast domed basilica (Plate 1, Fig. 1), comparable in height to a modern building of fifteen stories, was brought to successful completion in less than six years, between A. D. 532 and 537, by Justinian's architects Anthemius and Isidorus. Following injury from an earthquake in the previous year, the initial dome collapsed in 558. Justinian entrusted its reconstruction to Isidorus the Younger, nephew of the first Isidorus, who is reported to have raised the crown of the new dome approximately 6.25m., thereby reducing its lateral thrusts as compared with those of the first, flatter dome. This second dome, which was completed before 563 and parts of which remain today, has been injured subsequently by earthquakes on two occasions: In 986 a segment was injured when the western arch gave way, and repairs were accomplished by 994 under supervision of Trdat, an Armenian architect; in 1347 a segment came down when the eastern arch collapsed and restorations were finished by 1354 under direction of Astras, Faciolatus and Giovanni Peralta. These damages which, according to the accepted history, are the only instances of major injury incurred by the structure, illustrate why Hagia Sophia merits our closest attention. The present dome, constructed in the sixth century upon supports designed for an earlier dome of unknown form, incorporates repairs of undetermined extent which date from the tenth and fourteenth centuries. Further, the system of support for the dome, which is not altogether logical, raises questions of unusual structural interest.

The rapidity of Hagia Sophia's successful construction ranks it among the great engineering feats of all time, a speed even more remarkable in

*Presented at the Symposium on Medieval Architecture at Oberlin College, October 16-17, 1948.

view of certain novel structural devices employed in it. Pendentives of immense size, once thought to have been invented and simultaneously to have reached their fullest development here, were carried beyond the farthest limits of previous experience. These spherical triangles rise within a square formed by four equal arches which convey the impression that the dome is carried on a regular geometrical figure. But while the four visible arches which appear to carry the dome are apparently alike, those which actually support the dome are of two kinds and are supported in turn by different structural devices.

The eastern and western arches, which span the nave transversely, are thin at their crowns, open beneath, and braced by semidomes of equal diameter; these are working arches. The arches of similar span, which are visible along the sides of the nave, are not primary supports of the dome but are applied to the faces of the working arches; the latter are flush with the tympana and therefore invisible from the nave. The northern and southern structural arches, as compared with the eastern and western, are shorter in span, thicker through the crown, broader on soffit, and unsupported except by buttresses (Plate I, Fig. 2) built at right angles against their springings. Hence, because of this dual system of support, the lateral thrusts of the dome, which are radial and equal in all directions, are countered on two sides by semidomes and on the other two by buttresses which do not lie in line with the forces they are intended to oppose.

The surpassing interest that ingenious design and an eventful history give to Hagia Sophia may be summed up as follows: Despite the embodiment of an untested and somewhat illogical principle of support for the dome, the church was successfully erected with unprecedented speed at a scale of size and magnificence unrivalled for several centuries; it has suffered serious injury from three earthquakes and has survived innumerable others; it has endured the effects of time, decay and intermittent neglect; yet it comes down to us after 1400 years of constant use, not as a lifeless ruin, but with structure intact and forces still in action. It is consequently more than a mediaeval monument of unparalleled historical interest; it is, in effect, a vast and living laboratory for studying the best techniques employed by known architects within precisely dated periods at intervals of four hundred years throughout the Byzantine epoch. Because of the part played by physical forces in disasters that have befallen the building, an attempt to explain its complex form must take into account certain structural principles.

Since the stability of any structure depends ultimately upon the character of its foundations, it was imperative at the outset of our investigation to gauge foundation conditions beneath Hagia Sophia. This question has more than technical interest, for it touches upon one of the most colorful legends attached to the building: The belief that cisterns of great size are enclosed within its substructures. In the absence of permission to excavate, inspection of wells, drains and tunnels lying beneath the western half of the nave and narthexes was our only available source of information. Though data obtained in this manner are not final, their implications provide a useful point of departure for assessing the structure.

The well which has often been cited as an entrance to the supposed cisterns proved on examination to be a shaft cut from natural rock, the surface of which, it is now clear, lies from 1.0 to 2.0m. below present floor level. The proximity of this natural rock to the existing floor excludes the possibility that large cisterns were built into the original structure and suggests that the main piers and buttresses are built on rock. According to an analysis made by Prof. Frederick K. Morris, a geologist at M.I.T., the rock is a relatively weak Devonian layer. Pressures exerted on it by the supports of the dome, which were estimated by Prof. E. N. Gelotte from sources available before the start of work in the building, are in the order of magnitude of 105 tons per square meter. With these facts in hand, Prof. Morris and Dr. Karl Terzaghi, soil mechanics expert at Harvard, arrived at two significant conclusions: First, the estimated pressures are sufficient to cause subsidence in the Devonian layer; and, second, damage caused by earthquakes to buildings of Hagia Sophia's size which stand on rock results from the vibration in phase of large structural members and not from dislocation of their foundations. These principles, as will later become apparent, are indispensable to an understanding of Hagia Sophia's past history and present condition.

Next in importance to the question of founda-

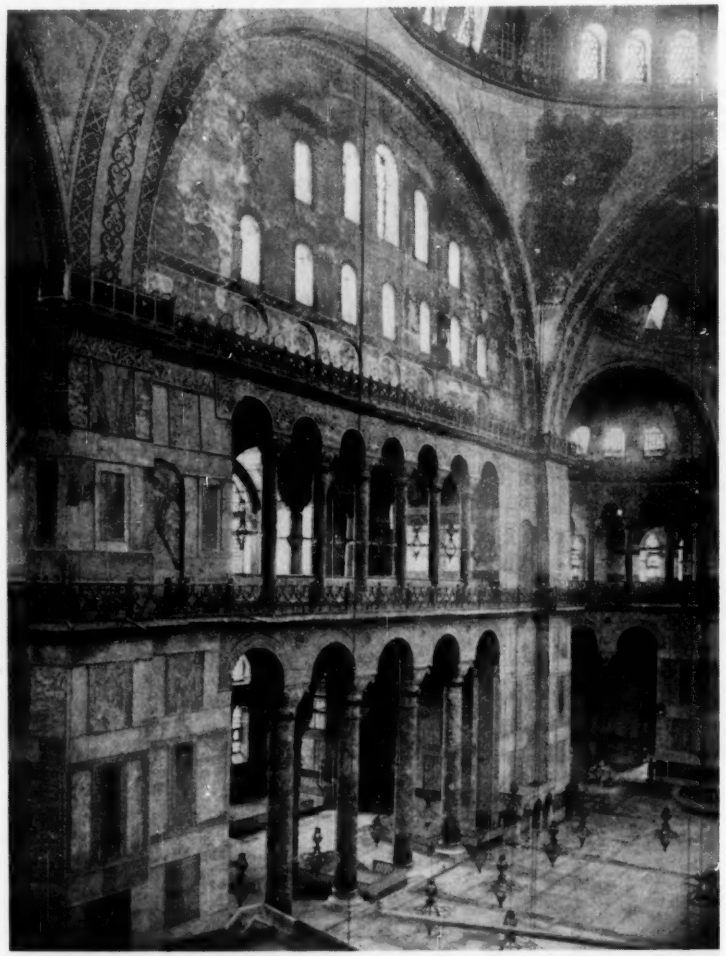


Fig. 1—Hagia Sophia: South Side of the Nave, Showing Southwest Pendentive (from negative in archives of the National Museum, Istanbul)

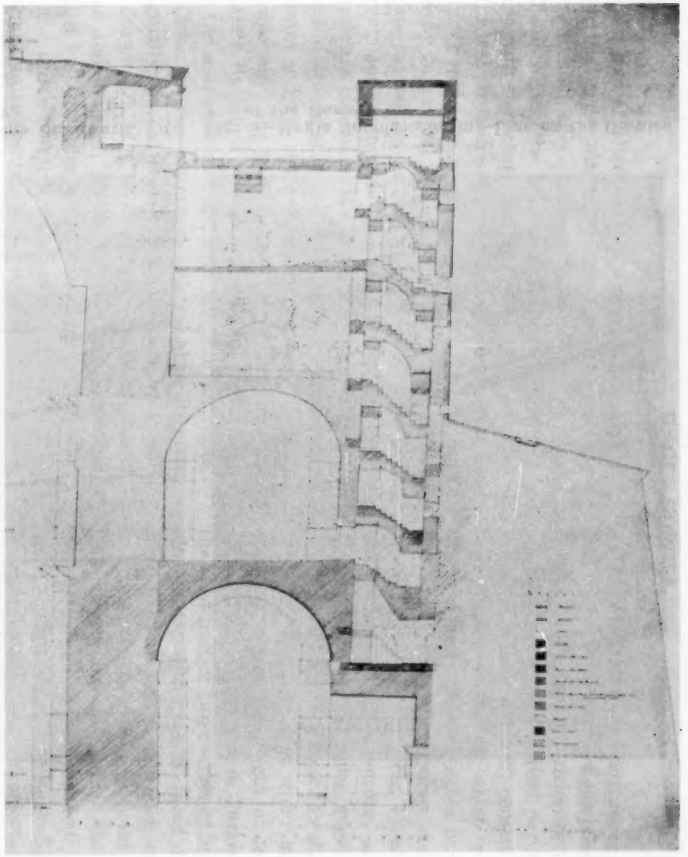


Fig. 2—Hagia Sophia: Southeast Buttress: Section (from a preliminary drawing)

Fig. 3—Hagia Sophia: Typical Brickwork of the Earliest Period (right) and Turkish Masonry (left)

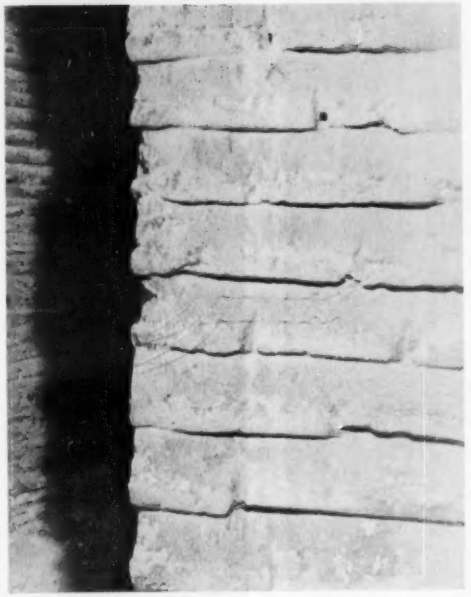


Fig. 4—Hagia Sophia: Byzantine Brickwork, Possibly of the Tenth Century.

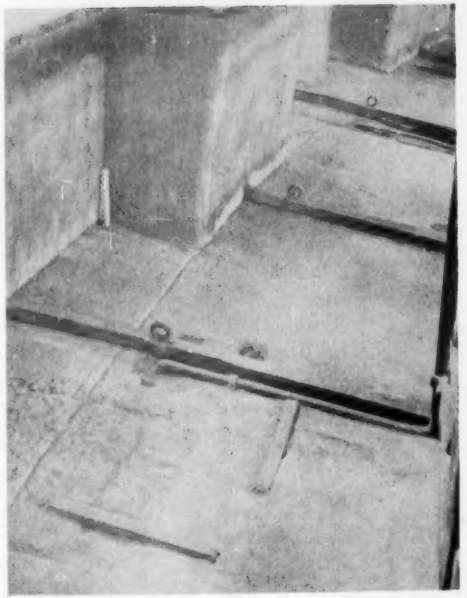


Fig. 5—Hagia Sophia: Setting Line on the Cornice of the Dome

tions is that of determining the precise character of structural materials. Until now the materials have been treated only in general terms because it is difficult under the best of conditions to come to grips with the actual fabric. Whereas in a Gothic cathedral structure and decoration are integral, in Hagia Sophia the working masonry is largely hidden by superficial decoration. All structural elements as well as non-bearing walls are obscured throughout the interior by marble veneer, and their details are hidden on the exterior by stucco; vaulting and arches are decorated inside by continuous mosaics and are covered outside by lead sheets of the roofing. The only places in the entire building wherein its fabric can be systematically examined are the stairwells enclosed with the four buttresses.

These buttress stairways (Plate 1, Fig. 2) were originally reached from outside the peripheral wall of the church at a level halfway between ground floor and gallery. From here they rose in eight and a half turnings to an overall height of 40m. Of the thirty-four turnings contained in the four original stairways, ten have been filled during later attempts at consolidation. There can be no doubt that lower levels of the buttresses, which are an integral part of the system of support for the floor of the gallery and its roof, were built during the original period of construction, but the details of walls enclosing the stairways differ so widely that general conclusions regarding the four cannot be drawn after examination of a single buttress. These critical differences necessitated measurement of all four which would amount, if their turnings were added together, to a single stairway twenty-four stories high. Since many of the turnings are lightless, their investigation presented earlier investigators with such insurmountable obstacles that the true nature of these complicated spaces is unknown and even the amount of their explorable extent has not been recorded. This lack is one of the greatest hindrances to adequate assessment of the structure, for the buttress stairwells are repositories of invaluable data regarding sixth century construction. The walls of these modest spaces remain, except for thin and recent coatings of limewash, exactly as they were left by the builders of various epochs. Cracks, changes in materials and techniques, presence or lack of bonding, etc., provide a graphic history of vicissitudes endured by the structure, and the buttresses consequently became the focus of our investigation.

The first notable point regarding materials is that the buttresses are not composed of homogeneous masonry but contain brickwork of three different kinds. That of the earliest period of construction (Plate II, Fig. 3, at right) consists of square bricks, the exposed edges of which average 0.045 by 0.375m.; its horizontal joints have a slightly concave surface, and ten courses measure 1.01m. The second type (Plate II, Fig. 4), also Byzantine and possibly of the tenth century, is distinguished by variety in sizes of bricks, edges of a few being 0.06 thick and 0.60m. long, by sloping, or "weathered" joints, and by a wider spacing of courses which increases the height of ten to as much as 1.26m. The third type is Turkish; it consists for the most part of two courses of bricks .03 by .285m. alternating with one of faced rubble (Plate II, Fig. 3, at left). While such obvious diversities in the materials provide a point of departure for defining the extent to which the original form of the buttresses has been changed, the brickwork has more to offer than can be learned by inspection.

Legends tell that the mortar used in Hagia Sophia was mixed with a broth of cooked barley and willow twigs. If such vegetable substances were every employed, Prof. Morris finds no traces of them; his analysis of a thin section made from a specimen of the earliest mortar shows it to consist of burnt lime, sand, occasional pieces of gravel and a considerable immixture of crushed brick. Of these ingredients a grain of sand and a chip of brick merit brief digressions.

In the specimen of mortar Prof. Morris identified a grain of a special kind of granite which according to available geological information could only have come from exposures along the coast of the Black Sea north of Istanbul, perhaps from as far as the Dobrudja. This grain of sand was carried by ocean currents to within access of the builders of Hagia Sophia, and its presence indicates that sea sand was used in the original mortar. In this connection it may be pertinent to recall Vitruvius' suggestion to the effect that mortar made with sea sand is improved by an admixure of crushed brick. Vitruvius' advice, according to Prof. Walter C. Voss, an authority on masonry construction, is good, but his reasoning may have been wrong. If he thought that chips of brick would counteract the effect of salt on the setting up of mortar, he was mistaken, for salt has no effect on it. On the other hand, the disposal of excess water raises prob-

lems in the case of modern cements, and the addition to Byzantine mortar of a porous substance like crushed brick, which assists the absorption of excess water, afforded particles of lime a more intimate contact with the bricks and thus improved the density of the mortar. From the characteristics of a single chip of brick which happened to be in our specimen of mortar there emerged another fact of importance to the history of building in Constantinople.

Mineralogical components of a chip of brick in the earliest mortar—a chip from a brick older, of course, than the building itself—are identical with those of bricks employed in the initial construction and those manufactured by the Turks in the fifteenth century or later. This uniformity, which Prof. Morris identified by studying thin sections of specimens of bricks of the typical sizes mentioned above, indicates that they were made from the deposits of marine clays in which Istanbul is situated, for clays of marine origin are capable of producing homogeneous bricks over a long period of time. The minerals identified in a brick of the largest size are, in contrast, entirely foreign to the clays in the region of Istanbul, and these largest bricks must have been imported, possibly from Rome where similar sizes were commonly used in centuries prior to the Byzantine era.

As to the capacities and behaviour of masonry composed of the bricks and mortar just described, there are significant clues. In the first place, the beds of mortar are thicker than the bricks themselves; the ratio of brick to mortar, by volume, is about 1 to 1.4, and there is consequently about half again as much mortar as brick in certain parts of the structure. This fact leads Prof. Voss to suggest two probabilities: It is likely that bricklaying, despite the speed with which the initial construction was prosecuted, had to proceed in a horizontal direction and rather slowly in order to prevent the weight of superimposed courses from pressing the uncured mortar out of such thick joints; and because considerable time is required for mortar in deep masses to dry out and attain its full strength it will flow if subjected prematurely to excessive pressure. What might be called an "acquired" characteristic of the brickwork may be due in part to this action.

Brick courses at all levels in side walls of the buttresses are no longer horizontal but slope down and away from the main piers at an average angle of about 1 in 40. This measure of the deformation undergone by the buttresses is related to the inclination of the piers themselves.

One of the most striking features of Hagia Sophia's nave is the appreciable backward inclination of the four piers from which spring the arches of the dome. In a height of 23m. between floor and springing the faces of the piers lean backward an average of 0.50m.—at an angle, in other words, of 1 in 48. This deviation of the main piers from vertical corresponds closely with the deviation of brick courses in the buttresses from horizontal. It is obvious that the piers and buttresses have tipped backward as a result of lateral thrusts exerted by the dome, and we may now by reference to principles suggested above attempt an explanation of some of the forces involved.

The thrust of the first, low dome tended to tip over the main piers and their buttresses in a direction transverse to the nave. In view of the speed of initial construction, it is probable that the arches, piers and buttresses were charged with these thrusts before their mortar had attained its ultimate strength, and it may have flowed under the pressure. We now know that pressures exerted by the main structural elements are sufficient to have caused subsidence in the natural rock beneath them. But because of the tendency of the thrusts of the dome to tip the buttresses outward, these bearing pressures were not evenly distributed: They increased at the outer ends of the buttresses and decreased correspondingly at the front edges of the piers. Hence the compression of the rock was not uniform but was greater at the outer ends of the buttresses. The piers and buttresses slowly leaned backward in consequence and their gradual movement was accompanied by a corresponding widening of the span of the eastern and western arches. While these relentless actions were in progress, there occurred the violent earthquake of A. D. 557 which aggravated failures doubtless already apparent. It is therefore astonishing that the first dome, instead of collapsing at once, stood precariously until the following year.

Before leaving this partial explanation of causes contributing to the first major disaster that befell Hagia Sophia, three further points deserve mention. In the first place it should be said in defense of Anthemius and Isidorus that they cannot be held accountable for the part played by the compression of natural rock, for the capacity of rock

to compress is a relatively recent discovery. In the second, it is probable that subsidence reached its maximum during the life of the first dome and ceased altogether with its collapse in 557. Finally, there is the question as to why the inclination of the piers and buttresses, which is so startling a feature of the interior, is not apparent on the exterior. Fortunately for the peace of mind of modern visitors, the end walls of the buttresses, which are out of plumb 1.0 in their height of 40m., have in recent times been gradually thickened from the top downward (Plate I, Fig. 2); today their end walls on the outside are indeed vertical.

The degree of deformation in these original structural walls offers another useful principle for determining features that belong to the period of initial construction. Since all subsidence appears to have ceased when the original dome collapsed, any structural element or ornamental detail which inclines to the same degree as the piers and buttresses is likely to be original; and, conversely, any feature which is today vertical or horizontal must necessarily be a later addition or repair. This principle is of no use in connection with the dome, however, for we know that it was entirely rebuilt after, it now appears likely, all deformation had ceased, but fortunately there is another kind of evidence which simplifies the solution of its problems.

A type of evidence with unusually fascinating aspects, which has not received the attention it merits, is found in superficial marks on many kinds of stones. These marks are of three classes: There are graffiti in several languages which may one day contribute much of historical interest; there are masons' marks which occur on floor slabs, all stones with carved ornament and most polished structural blocks, more than 1030 of which were assembled in the course of our survey; and there are setting lines scribed by the original builders for the practical purpose of laying out their plans. Lines of this last type are immensely valuable for a structural study, in that they show the intentions of the builders and permit us to gain by inference a conception of their methods of procedure. It is primarily on the basis of such a setting line that problems connected with the dome may be attacked.

There is incised in the surface of the dome cornice a broken curving line (Plate II, Fig. 5) which coincides with the known history of the dome. It is continuous above the northern and southern arches, which are not reported to have fallen, and it is missing over the western and eastern arches which were repaired in the tenth and fourteenth centuries. When first surveyed in 1940, no masonry of the shell of the dome was visible, and it was our preliminary conclusion that five ribs of the second dome remain today over the southern arch and seven over the northern. Thanks to the removal of loose plaster during repairs undertaken by the Turkish government in 1946, it is now possible to correct our first conservative estimate. Unbonded breaks between two kinds of masonry have been uncovered on each side of the dome one rib farther west than we had supposed them to be. This means that six ribs of the dome of Isidorus the Younger remain on the south and eight on the north, that Trdat repaired thirteen ribs when he rebuilt the western arch in the tenth century, and Astras, Faciolatus and Peralta thirteen when they reconstructed the eastern arch in the fourteenth century. While no setting lines remain from the last repair, those employed by Trdat are unbroken and offer substantial clues as to the method by which he laid out the repair of the western segment. The clearest implications of method, however, are found in the relationship between remaining lengths of the earlier line.

The problem of rebuilding a dome on deformed piers was surmounted by constructing a slightly elliptical dome. The curves scribed above the northern and southern arches both have a radius of 15.71m., but they were struck from centers 2.55m. apart rather than from a single center point. They appear to have been marked by a chisel held in a loop in one end of a cord which was fastened at the other to these fixed points. Since the laying out of the curve of the shell was one of the most important operations involved in his reconstruction, it seems highly probable that the curves were incised under the supervision of, and the centers personally located by, Isidorus the Younger.

It is hoped that such new types of evidence as have been summarily presented in the foregoing pages may contribute to a more complete appreciation of the unique qualities of the structure of Hagia Sophia.

BOSTON, MASSACHUSETTS

Current Research On The Church Of Saint Martin At Tours*

CARL K. HERSEY

The program of research begun before the war on the architectural history of the church of Saint-Martin at Tours was carried on intensively during the year 1947-48 with the aid of a fellowship from the John Simon Guggenheim Memorial Foundation. Work was directed chiefly toward the restoration of the Gothic form of the monument, the state in which it stood for over five centuries until its regrettable destruction at the end of the eighteenth century (Pl. III, Fig. 1). As was done in the study of the earlier architectural history of the church,[1] all data are being graphically recorded in a series of scale drawings which integrate the scattered evidence and recreate the basic form of the monument together with much of its detail. By means of this technique, one of the most important medieval monuments of France, a church hitherto scarcely more than a name, is being returned to knowledge and reinstated in its proper place in architectural history.

The church has a long and complex history dating back to the fifth century, when Saint Perpet built the structure that is described by Gregory of Tours. It underwent alterations and rebuildings during the subsequent centuries as it suffered the vicissitudes of the early Middle Ages. Notable among these transmutations was the erection of a church early in the tenth century after the last of the Norman raids in Touraine. Evidence strongly indicates that it is this building which possessed the fully developed ambulatory with radiating absidioles that was in part uncovered in the excavations of 1886 and which has been the subject of so much controversy.

With the construction between 997 and 1014 of the large wooden-roofed basilica financed by Herve de Busancais, the church of Saint-Martin entered upon a new phase of development. Grand in scale, it was characterized by an ambulatory with five radiating chapels, transept chapels in two stages, triforium galleries and open transverse tribunes at the ends of the transepts. Beginning about 1050 the wooden roofs of the basilica were replaced by barrel vaults buttressed by quadrant vaults in the troforium galleries,[2] the first clear expression of the structural formula associated with the largest of the Pilgrimage churches and brought to such perfection at Santiago de Compostela and Toulouse. Contemporaneously with the advent of barrel vaulting at Saint-Martin, towers were incorporated in the ends of the transept arms, half within, absorbing the open transverse tribune (Pl. IV, Fig. 5), half without, in the form of an open porch. The two lowest stages of the *Tour Charlemagne* are the sole remaining vestiges of the original north transept tower.

The partial collapse of the south face of this tower in 1928 revealed the column, Romanesque capital, and the twin arches that supported the terminal tribune of the transept before its engulfmen in the masonry of the *Tour Charlemagne*. The splendid capital (Pl. III, Fig. 2) is of great interest because of its scale, subject, and early date. Judging by its architectural environment, it must be assigned to the first half of the eleventh century. It deserves intensive study.

Also brought to light was a well-preserved fresco of Saint Florent. Covered by masonry revetments not long after its execution, it was released by the crash of 1928 and revealed with much of its original freshness and coloring intact.[3] Like the capital, it is a conspicuous addition to the corpus of Romanesque art.

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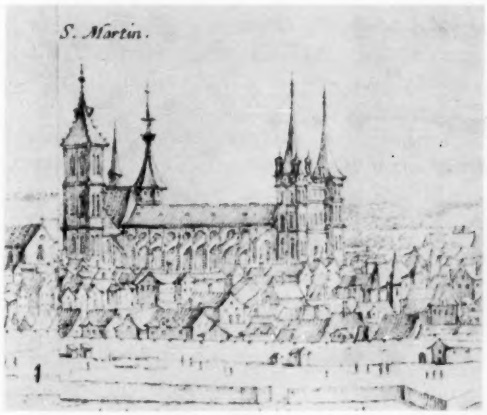
*Presented at the Oberlin Symposium on Medieval Architecture.

1. Carl K. Hersey, "The Church of Saint-Martin at Tours (903-1150)," **The Art Bulletin, XXV**, March, 1943, pp. 1-39.

2. Certainly in the transept, and probably in the choir and nave. Aymery Picaud, in the second quarter of the twelfth century, noted in a famous passage in the Pilgrims' Guide the similarity between the churches of Saint-Martin and Santiago de Compostela. It seems hardly likely that such a definite analogy would have been pointed out had the nave of Saint-Martin remained covered with a wooden roof. See Jeanne Vielliard, **Le guide du pelerin de Saint-Jacques de Compostelle**, Macon, 1938, p. 60.



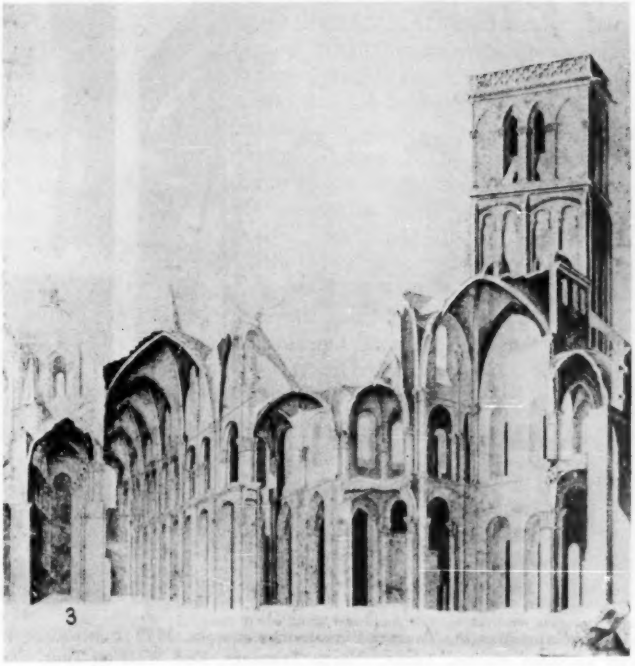
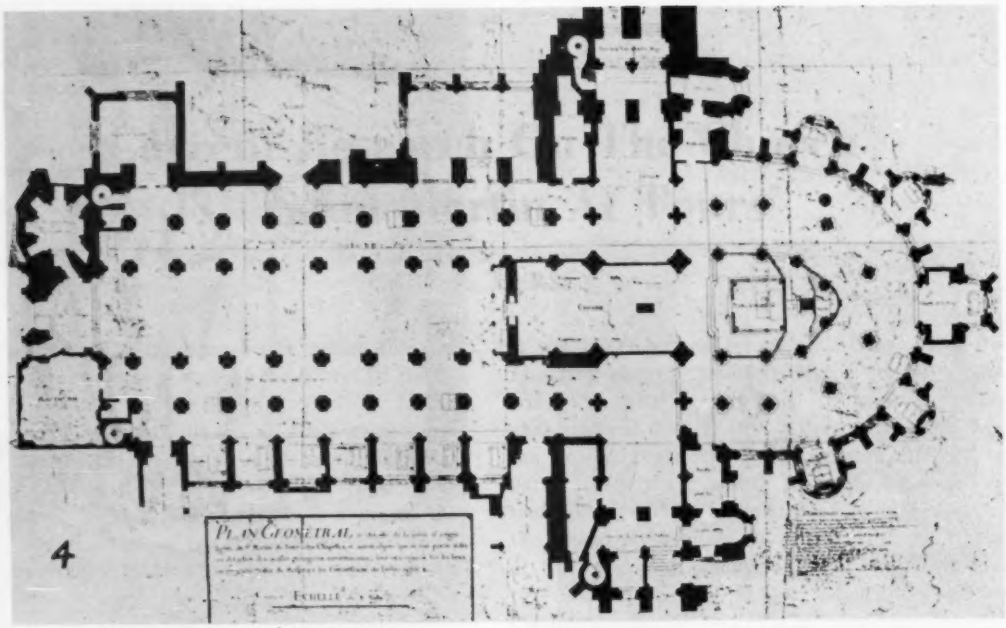


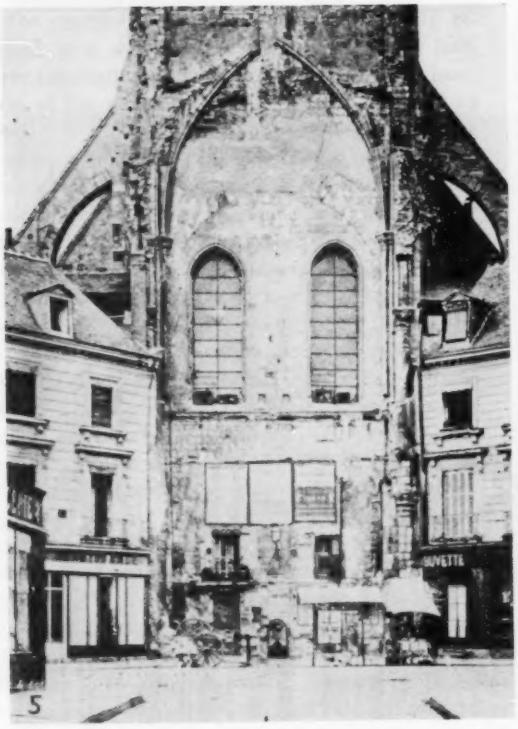
Fig. 1—Saint-Martin, Tours: Engraving by DeLincler, 17th Century

Fig. 2—Saint-Martin, Tours: 11th Century Capital (from cast)

Fig. 3—Saint-Martin, Tours: Perspective by Pinguet, ca. 1798

PLATE IV





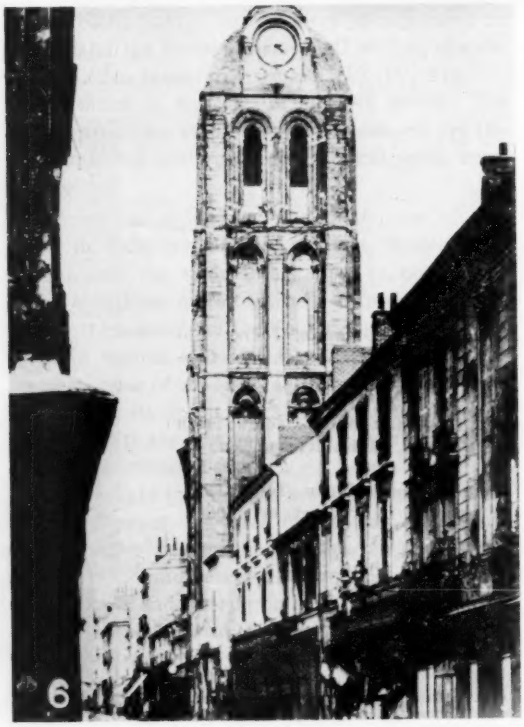


Fig. 4—Saint-Martin, Tours: Plan by Jacquemin, 1779
Fig. 5—Saint Martin, Tours: North Transept, End Wall on *Tour Charlemagne*
Fig. 6—Saint-Martin, Tours: South Tower of West Facade *(Tour de l'Horloge)*

The last of the many architectural transformations of Saint-Martin, Gothic in style, was grafted on to this Romanesque fabric. Shortly after the middle of the twelfth century, when the cathedrals of Angers and Le Mans were modified by the introduction of heavily ribbed bays of vaulting, the Chapter of Saint-Martin initiated a program of reconstruction which eventually transformed the church into a Gothic monument. Salvaging the arcades of the transept and nave to the level of the triforium stringcourse, the builders first rebuilt the upper levels in the early Gothic style (Pl. III, Fig. 3). Later in the century a handsome facade was created, the south tower of which survives (Pl. IV, Fig. 6). Early in the thirteenth century a complete Gothic reconstruction of the chevet was carried out (Pl. IV, Fig. 4).

The Gothic transformation of Saint-Martin, although well reported in archaeological and graphic sources, has hitherto aroused little interest on the part of architectural historians who have been more intrigued with the earlier states of the church. Careful investigation carried out mostly during the past year has not only established the Gothic form of the monument, but has also brought out a significance of design, particularly in the facade and chevet, that has never been suspected. On the evidence of the Jacquemin plan of 1779 (Pl. IV, Fig. 4), the Pinguet perspective of 1798 (Pl. III, Fig. 3), and the records of the excavation between 1860 and 1886 of a part of the foundations of the chevet,[4] the Gothic forms of the facade, nave, transept, and chevet have been worked out and reduced to scale drawings. These not only record and integrate the assembled data, but also give sufficient visual reality to the restoration to permit considerable stylistic and aesthetic evaluation.[5]

As in the nave of the Cathedral of Le Mans, approximately square bays of heavy, ribbed vaulting were constructed above alternate piers of the nave and transept (Pl. III, Fig. 3). At the same time the Romanesque quadrant vaults of the triforium level were replaced by ribbed quadripartite bays which, together with transverse walls opposite the main conoids, contributed to the abutment of the nave and transept vaulting. Paired clearstory windows of modest aperture admitted light at the level of the main vaults. In order to improve the relationship between the higher roof level of the nave and transept and the north transept tower, the primitive belfry was replaced by one of loftier dimensions which survives today as the third stage of the *Tour Charlemagne*. Graphic evidence proves that no such alteration was made in the south transept tower.

In the last quarter of the twelfth century the campaign of reconstruction reached the facade, which was almost completely rebuilt in a design of remarkable beauty. This facade has now been recovered on the basis of excellent evidence and is of notable significance. The extant *Tour de l'Horloge* (Pl. IV, Fig. 6), the south tower of the facade, fortunately preserves on its northwest corner sufficient vestiges of the stringcourses and arcadings of the lost central panel to make possible a complete restoration. By integrating the mouldings, arches, and levels with the measurements of the plan of the facade recorded by Jacquemin and with details reported in the DeLincler engraving (Pl. III, Fig. 1) and the Borrel lithograph, the design may be restored with a high degree of accuracy.

Both the *Tour de l'Horloge* and the lost north tower rose above base structures dating from the Romanesque period. Both were almost identical in form except for the treatment of the spires. The central panel between the towers was unusually rich. It was divided into three vertical and five horizontal zones by pilasters and stringcourses, and was liberally embellished with decorative arcades. The first two stages were strongly Poitevin in character with the central portal flanked at each side by a smaller arch[6] and with a range of blind arches above. The third zone was dominated by a large, round-headed window flanked by tall, blind arches, a disposition similar to that on the facades of Saint-Denis and Angers. The area was further enriched by a continuous range of delicate arches which traversed the spandrels from one tower to the other, accommodating their bases to the curvature of the arched heads as on the main portal of the Cathedral of Rochester. Above was another arcaded zone surmounted by a high screen crowned with crenelations. Angle pinnacles enriched the base of the northern spire (Pl. III, Fig. 1).

Because of its effective scale and richness of

3. The fresco, now transferred to canvas, is temporarily deposited in the Hotel de Ville in Tours. It is illustrated by Georges Collon, La Loire Tourangelle, Grenoble, Paris, 1947, p. 64.

4. For bibliography, see Hersey, op. cit., p. 3, note 11.

5. The restoration drawings are not yet ready for publication.

6. That to the north was blind, but the southern arch was pierced for use as a narrow door, perhaps at a later time.

detail, the western facade must be given a prominent place among early Gothic frontispieces. Its reconstitution is a major contribution to the study of Gothic architectural design.

Following a fire in 1202, the entire chevet of Saint-Martin, which had survived unchanged in plan since the time of Herve, was rebuilt in a style of Gothic more advanced than that of the western parts of the church. Reconstruction of the chevet could not lead to a deepening of the choir, such as occurred at Le Mans, because of the inviolable position of the tomb. Instead, the desire for increased size was satisfied by the doubling of the aisles and ambulatories and by the widening of the main bays of the choir. Such broadening of the plan produced awkward distortions in the aisle bays at the juncture of the transept and choir.[7]

The Jacquemin plan does not delineate the rib system of the new chevet (Pl. IV, Fig. 4), but it is sufficiently detailed to permit a reliable resoration of the vaulting. The inner ambulatory was covered with standard, broken-rib, trapezoidal bays, but the outer was vaulted in an uncommon system comprising trapezoidal bays which converged on the entrances to the absidioles and alternated with double triangular bays in the interval between them. This system, together with the widely spaced absidioles separated externally by two windows and a buttress, occurs on the apse of the contemporary Cathedral of Bourges and in the modest church of Saint-Martin at Etampes, the latter quite certainly created in emulation of the system at Tours.

The relationship between the chevets of Saint-Martin and Bourges that is suggested by analogies in plan is further borne out by analogies in elevation. Of the two common solutions to the problem of handling double side aisles in elevation, that of raising the inner sufficiently above the outer to permit the introduction of a triforium and clearstory was followed at Saint-Martin, where it had already appeared earlier in the nave (Pl. III, Fig 3). As in the choirs of Bourges, Le Mans, and Coutances, the main arcades were sufficiently high to equal the arcade, triforium, and clearstory levels between the double aisles. The choir vaults were of the same height as those of the nave, but the surmounting roof rose considerably above that of the nave as is clearly indicated in graphic sources (Pl. III, Fig. 1).

The buttressing system of the choir was similar to that at Coutances. The Borrel lithograph and a miniature by Jean Fouquet report the system. Continuous single-strut flying buttresses carried the thrusts of the main vaults across the double aisles and ambulatories, uninterrupted by the usual intermediate buttresses between the aisles.[8] At a lower level, secondary struts braced the vaulting of the high inner aisle and ambulatory as at Coutances and Bourges. Thus the choir of Saint-Martin emerges as a conspicuous addition to the Bourges-Le Mans-Coutances group and may be tentatively assigned to a position between the first two monuments.

The fabric of Saint-Martin as it was developed in the twelfth and thirteenth centuries underwent few changes in the subsequent centuries of its existence. In the fourteenth, chapels were installed between the buttresses of the south flank (Pl. IV, Fig. 4) and a stage was added to the *Tour Charlemagne* to improve its relationship with the lofty choir roof (Pl. III, Fig. 1). The cloister underwent a partial transformation in the fifteenth century, as extant buttresses on the west side testify. Work was carried on in the new Renaissance style in the early sixteenth century, and the east gallery is largely intact today.

In this form the church survived until the end of the eighteenth century when, through indifference and neglect, it suffered irreparable damage and was finally destroyed. Its site was transformed into streets and private lots; only the *Tour Charlemagne* and the *Tour de l' Horloge* were spared to mark the site of one of the most important churches in France. The recovery of its various architectural states makes available once again a monument of great intrinsic interest. But perhaps even more important is the unsuspected significance of its forms and their importance in the architectural history of the Middle Ages.

UNIVERSITY OF ROCHESTER

7. Cf. similar distortions in the plan of the Cathedral of Evreux.

8. The span was about 10 meters.

Early Gothic Architecture — New Problems As A Result of the St. Denis Excavations*

SUMNER McK. CROSBY

Although the Abbey of St.-Denis is famous in the annals of France as the Royal Abbey — the burial place of Kings and Queens and of a few national heroes — and is mentioned as well in most accounts of the development of medieval art, no detailed study of the existing building or of the churches that preceded it was available when I began my graduate studies. It was unquestionably the phrase "cradle of Gothic architecture" that caught my eye and provoked more than the usual notation of major campaigns of building or pecularities in the construction. Kingsley Porter, Emile Male and others seemed to agree that St.-Denis was of prime importance in the very first experiments leading from the Romanesque to the Gothic style. Yet no one seemed to know exactly what had been built under the direction of Abbot Suger in the twelfth century.

Interested scholars, among them Dehio and von Bezold, took it for granted that the plan published by Viollet-le-Duc in his *Dictionnaire Raisonne de l'Architecture* represented the foundations of the early buildings to be found under the existing nave and transept. Most experts, furthermore, were of the opinion that it would be useless to attempt any modern excavations, since the depradations of the Revolutionary mobs and the extensive restorations of the nineteenth century must unquestionably have obliterated, or at least disfigured, all vestiges of early masonry. Fortunately, Viollet-le-Duc's plan does not include either the eastern or western extremities of the present building. This gave me sufficient excuse to request permission to excavate first in the crypt and then in the western portions of the south aisle and nave. Although the work in the crypt, begun in 1938, revealed little that could be called startling, and nothing contrary to the indications of Viollet-le-Duc's plan, the 1939 excavations in the south aisle and nave exposed masonry that could not be explained by it. Most perplexing were the two bases for wall piers (the half piers engaged in side walls) found directly under the existing, or 13th-century exterior walls. Nothing in Viollet-le-Duc's work corresponded to such a construction and I began to suspect the whole plan. The War obviously precluded any further research and it was not until the summer of 1946 that requests for permission to continue the excavations could be addressed to the Director of the *Monuments Historiques*. The French authorities graciously allowed me to begin excavations along the exterior of the south wall of the nave and then to open several trial holes in the south and the north arms of the transept. These permissions were continued in 1947 and 1948 until almost the whole available area of the transept arms, of the north side-aisle and of the central portions of the nave were opened for investigation. Without the continued good will of the French officials and of the clergy, who endured the inconveniences of the dirt and general upheaval inside the building, the work could never have been completed. I should also like to express my gratitude to the Guggenheim Foundation and to the American Philosophical Society for their generous grants in 1947 and 1948.

The results of these unexpectedly extensive excavations were surprising and significant. Viollet-le-Duc's plan was proven to be completely inaccurate and useless. It is now possible to reconstruct accurately the plan of almost all of the Carolingian church, dedicated in 775, of the chapel added to the east of the apse in 832, of the tower begun late in the eleventh century with funds given by William the Conqueror, the finally of the entire plan of the twelfth-century church, to the building of which Suger devoted so much energy. Although the earliest buildings are interesting — only this last summer we discovered that the Carolingian church

*Presented at the Oberlin Symposium on Medieval Architecture.

had a western apse or chapel — this paper is intended to expose only some of the problems related to Suger's early Gothic building.

No one questions the date of 1140 for the consecration of the western portions of Suger's building or of 1144 for the consecration of the eastern portions including the choir with its ambulatories and radiating chapels. These are established by Suger's writings, only recently made so effectively available to American students by Erwin Panofsky's excellent translation. There has been some discussion about the actual beginning of the work and considerable vagueness about the extent to which it had been completed at the time of Suger's death in 1151. I believe there is good evidence, textual and otherwise, to uphold the date of 1130 for the establishment of the work shops at St.-Denis. There is now incontrovertible evidence that Suger did not live to see the completion of the building and indeed that it was unachieved until the thirteenth century, when Pierre de Montreuil erected the existing nave, transept and upper portions of the choir. Yet, if Suger did not complete his building, the foundations and part of the walls joining the eastern and western portions were built so that we can reconstruct the intended plan with certainty. There is no need to recapitulate here the description of the twelfth-century masonry discovered during the excavations, which has already been given in the *Gazette des Beaux-Arts, Melanges Henry Focillon,* 1947, and in the *Bulletin Monumental,* 1947. No further twelfth-century remains were uncovered in 1948. It is sufficient to state that the plan included a nave with double side-aisles and a non-projecting transept. The large dimensions of the portal, opening to the south at a point where a transept might normally have existed, make it possible to suggest that a transept was proposed in elevation, if not in plan.

What are the problems, then, that the "new" twelfth-century St.-Denis poses for a student of early Gothic architecture? The plan, and the structure, I believe, was a curious combination of deeply rooted, traditional forms and of daring innovations. The first campaign, completed in 1140, contemporary with the early work at the Cathedral of Sens, saw the erection of the western portions, or narthex. It was a large, rectangular mass, to be surmounted by twin towers, which were set back several feet on the upper platform from the plane of the facade. The lower nave and single side-aisles are separated by tremendous compound piers, obviously designed from the very beginning for the support of ribbed vaults. The upper galleries, or tribunes, infrequently visited today, were chapels, as vividly described in Suger's texts. The different levels of the stories are clearly reflected in the design of the facade, which thus, in spite of the strong verticle accents supplied by the heavy wall buttresses, displays a hesitant compromise in the evolution of the twin-tower facade. The entire construction must stem from northern traditions, reflecting the massive Carolingian west-works, as well as the trend toward the Gothic harmonic facade, especially notable with the early upper rose window. The heavy, often awkwardly constructed rib vaults, identify the construction as proto-Gothic, if not Gothic, but the ensemble must be considered as developing out of basically Romanesque traditions. The three portals, with their remnants of twelfth-century sculpture, present a problem in and of themselves. We were able to make a "spot" cleaning of the central tympanum and archivolts in 1947 and proved that considerably more detail of the original sculpture remains than had been believed. An unexpected find during the excavations in the south transept, to be described at the end of this paper, throws new light on this problem and strengthens the thesis that the sculptors at St.-Denis were responsible for initiating the theme and style of the early Gothic Royal Portal.

The excavations have proved that this narthex was joined to the existing Carolingian nave by a simple, non-vaulted construction of five bays which necessitated the complete dismantling of the Carolingian facade. Work was also begun almost immediately on the eastern portions, as described by Suger.

The existing crypt and the double ambulatory and radiating chapels above it have intrigued scholars for many, many years. Mr. Ward, I believe, is still skeptical as to the date of the ambulatory and chapel vaults. He is in very good company; but I have not been able to find any positive proof of their having been rebuilt. Indeed, close examination of the masonry leads me to the conclusion that they are twelfth-century, at least in their general form, in spite of extensive retouching in the nineteenth-century. But even if the implications of these vaults are not stressed, and they

would substantiate St.-Denis's claim to the distinction of being the "cradle of Gothic architecture," there are other new observations to be made about this unusual, evidently unprecedented, solution for the Gothic chevet.

One of the first problems I was confronted with at St.-Denis was the inaccuracy of existing plans of the actual building. We proceeded with much discomfiture and labor to make new plans of the entire structure. If one studies the plan of the chevet, it is surprising to note that the buttresses beween the radiating chapels jut out from the adjacent masonry at angles which do not coincide with the perimeter of the chevet as a whole. If the lines of the buttresses are continued inward, however, they meet at a point several feet to the east of the center for the radii of the outline of the chevet. This point could very easily have coincided with the keystone for the ribs of the semicircular, or upper choir, vaults. Such a system for choir vaults is not at all unusual, but we have not taken into account how this divergency of centers created counter-tensions in the masonry. Nor have we given, perhaps, enough credit to the farsightedness of the Gothic master-mason, or architect, who from the very beginning of his construction was able to compute and allow for these tensions, which increased the stability of his skeletal, stone framework.

One more remark about the structure of the crypt and ambulatories. If accurate sections are drawn, it will be noted that the middle columns of the ambulatory are not situated directly over the large round piers in the crypt. They are placed instead toward the interior of the choir and are, therefore, situated actually over nothing but the arches of the crypt vaults. This type of overhang again creates a tension in the masonry, the principle for which was brilliantly set forth by Jean Bony in his investigations of thin and thick wall construction in Anglo-Norman architecture of the eleventh and twelfth centuries (*Bulletin Monumental,* 1937). Since we have no positive evidence for the full elevation of Suger's choir, this manifestation of adherence to principles involving overhangs in vertical construction may be of value in proposing possible solution for this very interesting problem at St.-Denis. The elevation, somewhat gratuitously included in Panofsky's edition of Suger's writings, does not take these possibilities into account. My own studies have not progressed far enough to propose a satisfactory elevation for the choir, but there are certainly several significant new features to be considered. On the whole, it can be stated that, although the crypt is built in a conservative Romanesque manner with heavy walls and groin vaults, the plan as well as elements in the construction of the upper portions display forms and above all a treatment of interior volumes that can be termed precocious. I am convinced that a new master-mason arrived at St.-Denis to replace the architect of the narthex and to direct the construction of the chevet. Although he drew on the experiments of earlier builders in Normandy and the Ile de France, he had the genius to perceive the possibilities inherent in a ribbed-vaulted structure and to create thereby the essential elements of Gothic construction.

My observations so far have dealt almost entirely with existing portions of Suger's church. If we continue to examine the final campaigns of building at St.-Denis, we are faced, as I explained earlier, with the curious problem of trying to describe architecture that was never really built. It is certain, though, that the project to join the narthex and chevet was drawn up and actually started. The foundations and several beds of the masonry, including the bases for the wall piers, were built on both the north and south sides. The plan of a nave with double side-aisles and a nonprojecting transept is most interesting. It seems to throw St.-Denis into quite a different stream of influences than indicated in our previous discussion. It is a southern concept — southern that is in relation to Paris — notably observable in the nave at Cluny III and La Charite-sur-Loire and in the transept at the Cathedral of Sens. This plan is also familiar, and perhaps most famous, at Notre Dame in Paris. Why this seeming juxtaposition of influences? We have of course Suger's own evidence that he drew artists to St.-Denis from many regions. We can trace his own travels from Normandy to Rome, from the Rhine valley to southern France. He states as well his own predilection for such architectural forms as marble columns. If the projected nave with its double side-aisles were to have been supported on slender columns, similar to those used in the ambulatory, then the effect would certainly have resembled an Early Christian basilica. What would the effect

have been, if the inner side-aisles were surmounted by galleries and the entire construction vaulted with rib-vaults? One cannot help but think in terms of piloti construction. In any case the church envisaged by Suger and his architects would have been unusual in his time as well as ours. I hope someday to be able to present visual means of appreciating what St.-Denis was meant to look like in the twelfth century. I shall need the patience and inventiveness of a Kenneth Conant not to speak of the convincing documentation and presentation of a Paul Underwood. If Mr. Ward will continue to inspire those of us interested in medieval problems, such a result may be attained. It will necessarily be hypothetical, but at least many of the hypotheses will rest on foundations on which we can put our fingers.

In conclusion, mention should briefly be made of one other St.-Denis problem. It is the bas-relief discovered in 1947, used as a cover for a simple plaster sarcophagus only a few feet under the floor of the south transept. A study with detailed photographs of this superbly preserved piece of sculpture will, I hope, appear within the year. The style of these figures — the twelve Apostles under arcades — and the wealth of intricate ornamentation give us at once the full vocabulary of Romanesque decoration as well as the incipient characteristics of Gothic freedom of movement and plastic modeling. Similarities to other twelfth-century sculpture at St.-Denis, both in the crypt and on the western facade, strongly indicate that it was executed during Suger's lifetime. Other similarities to details of the Royal Portal at Chartres indicate a close relation between the work shops at St.-Denis and Chartres with probable priority for the St.-Denis artists. It is possible to state now with more certainty than ever before that Suger was indeed one of the outstanding patrons in the history of art. The plan of his beloved abbey church found its echo at Notre Dame in Paris and in the chevets of the great Gothic cathedrals. The work of his sculptors, not to speak of the metal workers, and of the artists responsible for the stained glass windows, created examples that were to inspire the artists who finally developed the Gothic style in all of its splendor.

YALE UNIVERSITY

Emerson and His Circle: Advocates Of Functionalism

ROBERT B. SHAFFER

Ralph Waldo Emerson has been largely ignored by historians of American architecture. But it is worth noting that he and certain friends, almost a century ago, were voicing a viewpoint which anticipates that of the later advocates of functionalism and related ideas.

It is generally assumed that Emerson cared little for architecture. The basis for this assumption can be found in his own writings. At the age of twenty-nine, while touring Italy in 1833, he confessed that he was more interested in men and associations than in art:

". . . how evanescent and superficial is most of that emotion which art and magnificence can awaken. It yields in me to the interest the most ordinary companion inspires.[1]

"In Rome it is not the diameter nor the circumference of the columns, it is not the dimensions nor the materials of the temples, which constitute their chief charm. It is the name of Cicero; it is the remembrance of Scipio and Cato and Regulus; the influence of human character. . . ."[2]

He admitted being perplexed by the calculating and analytical way in which he found himself looking at architecture,[3] and concluded that he "would rather know the metaphysics of architecture . . . than anything else in the matter."[4]

At the same time he showed enthusiastic appreciation of St. Peter's appeal to the senses:

"I love St. Peter's church. . . . It has a peculiar smell from the quantity of incense burned in it. The music that is heard in it is always good and the eye is always charmed. It is an ornament of the earth. It is not grand, it is so rich and pleasing; it should rather be called the sublime of the beautiful."[5]

He was likewise impressed by the Cathedral of Milan:

". . . the grand Gothic perspective of the aisles, the colors of the light which all enters through stained glass, the richness and magnitude of all the objects,—truly it is good to be there."[6]

But while at Milan, he received an impression of a different kind:

"Architecture — shall I speak what I think? — seems to me ever an imitation. Accustomed to look at our American churches as imitiative, I cannot get it out of my head that these which I now see are only more splendid and successful imitation also. . . . It is in the soul that architecture exists, and Santa Croce and this Duomo are poor far-behind imitations."[7]

A few years later (1836), he enlarged upon his distaste for imitative works in the following passage:

"The Marine Railway, the United States Bank, the Bunker Hill Monument, are perfectly genuine works of the times. So is a speech in Congress. . . . But Taylor's *Van Artevelde*, Byron's *Sardanapalus*, and Joanna Bailey's dramas are futile endeavors to revive a dead form and cannot succeed, nor, I think, can Greenough's sculpture. You must exercise your genius in some form that has essential life now; do something which is proper to the hour, and cannot but be done. But what is once well done, lasts forever, as the Gladiator, the Apollo, the Parthenon, the Iliad."[8]

Later generations of anti-revivalists might quarrel with the examples cited, but not the principle.

Emerson in 1841 developed his ideas on the "metaphysics" of architecture in an article which appeared in *The Dial*.[9] He maintained that the soul is subservient to the universal mind, and that

1. Journals of Ralph Waldo Emerson, ed. Edward W. Emerson and Waldo Emerson Forbes (Boston, 1909-1914), III, 100.
2. Ibid., p. 102.
3. Ibid., p. 146.
4. Ibid., p. 147.
5. Ibid., pp. 89-90.
6. Ibid., p. 143.
7. Ibid., p. 146.
8. Ibid., IV, 88-9.
9. [R. W. Emerson], "Thoughts on Art," The Dial, I (1840-1), 367-372.

therefore art, which is the creation of the soul, is strictly dependent upon Nature, which is the universal mind's representative. The division of Nature into the two aspects — material and ideal — led Emerson to the formulation of two interesting doctrines.

Since art is subservient to the material aspect of Nature, it follows that works of art must conform to natural laws. This applies especially to architecture. One cannot build as he wishes, but as he must. "It is only within narrow limits that the discretion of the architect may range. Gravity, wind, sun, rain, the size of men and animals, and such like, have more to say than he."[10] In other words, form is determined by material properties and physical laws. The architect cannot get free of this material basis, but on the other hand such things as the mass of a building or the materials used can actually be a source of pleasure.

Since art is also subservient to Nature in its ideal aspect, works of art will be expressions of the universal mind that formed Nature, and therefore must be based on reason and necessity.

"Arising out of eternal reason, one and perfect, whatever is beautiful rests on the foundation of the necessary. . . . Fitness is so inseparable an accompaniment of beauty, that it has been taken for it. The most perfect form to answer an end, is so far beautiful. . . . We feel, in seeing a noble building, which rhymes well, as we do in hearing a perfect song, that it is spiritually organic, that is, had a necessity in nature, for being, was one of the possible forms in the Divine mind, and is now only discovered and executed by the artist, not arbitrarily composed by him."[11]

Thus close did Emerson come to formulating the related doctrines of "honest construction, truthfully expressed," and "form following function," both of which are more advocated at the present time than in his day. However, among Emerson's friends there were several who held similar views.

One of these friends was Horatio Greenough, whose ideas on architecture are sufficiently modern to have been worthy of re-publication recently.[12] It is not surprising that Emerson held him in great esteem:

"At Florence, chief among artists, I found [1833] Horatio Greenough, the American sculptor. . . . Greenough was a superior man, ardent and eloquent, and all his opinions had elevation and magnanimity. . . . He was a votary of the Greeks, and impatient of Gothic art. His paper on American architecture, published in 1843 ['Remarks on American Art,' in the *United States Magazine and Democratic Review*] announced in advance the leading thoughts of Mr. Ruskin on the *morality* in architecture, notwithstanding the antagonism in their views of the history of art. I have a private letter from him — later, but respecting the same period — in which he roughly sketches his own theory. 'Here is my theory of structure: A scientific arrangement of spaces and forms to functions and to site; an emphasis of features proportioned to their *gradated* importance in function; color and ornament to be decided and arranged and varied by strictly organic laws, having a distinct reason for each decision; the entire and immediate banishment of all make-shift and make-believe.' "[13]

In 1852, while Greenough was preparing his book, *The Travels, Observations, and Experiences of a Yankee Stonecutter*, for publication, he not only exchanged a number of letters with Emerson on the subject of art and architecture, but also consulted him in Concord. It is clear from letters written by Emerson during this year that he had great admiration and respect for Greenough's theories.[14]

This exchange of ideas on architecture was terminated by Greenough's death in December 1852, but Emerson had other friends, now obscure, who were thinking along similar lines. One of these was Samuel Gray Ward, an amateur draftsman and art connoisseur, described by Emerson as "my friend and the best man in the city."[15] When Emerson assumed the editorship of the *Dial*, he published Ward's essay, "Notes on Art and Architecture,"[16] which developed the ideas on functional form and expressive materials suggested by Emerson in the same periodical two years previously.

Ward begins his article by hoping that his notes "may come to the eye of some person proposing to build a house or a church, in time to save a new

10. **Ibid.**, 369.
11. **Ibid.**, 375.
12. Greenough's ideas have recently attracted attention through their republication by H. A. Small, ed., with the title **Form and Function; remarks on art** (Berkeley, 1947).
13. From Emerson's **English Traits**, as quoted in **The New Path**, II (1865), 136. It is odd that this passage should have been chosen for publication in a periodical devoted to furthering the Gothic Revival according to Ruskin.
14. See **The Letters of Ralph Waldo Emerson**, ed. R. L. Rusk (New York, 1939), particularly IV, 271-2, 306, 311, 312.
15. In a letter to Carlyle, quoted in **The Correspondence of Thomas Carlyle and Ralph Waldo Emerson**, ed. C. E. Norton (Boston, 1897), II, 51-52.
16. **The Dial**, IV (1843), 107-115.

edifice from some of the faults, which make our domestic and what we call our religious architecture insignificant." He then continues: "The crowning and damning sin of architecture with us . . . is, the doing of unmeaning, needless things." In building, there should be a reason for everything.

"Let any man of good sense say to himself what sort of a house he would have for convenience, supposing him to have the space to build it on; then let him frame and roof these rooms, and if he has made his house truly convenient, its appearance cannot be absurd."

As for churches,

"If the builder would content himself with putting together . . . essential parts with the utmost simplicity, without any excrescences or breaking up, striving only to balance the members against each other, so that each should have its proper proportion, he would produce a specimen of national church architecture."

But Ward warns against mistaking plainness for simplicity. In order to become a work of art, some adornment must be provided for these essential parts. But this adornment must be suitable.

"The artist may employ all his taste and imagination in decorations, (always entirely subordinate,) of these main parts, taking care that his decorations are in keeping with the uses of the building."

Ward, like Emerson, points out the importance of the honest and expressive use of materials.

". . . every material should be employed with an eye to its peculiar properties.

"To see materials used skillfully and in accordance with their peculiar qualities is a great source of beauty in architecture. The vice of many of our . . . buildings is that the material is entirely disguised, . . . all we see is a plain white surface. Have done with this paltry concealment; let us see how the thing is built."

He criticizes the contemporary practice of using Greek forms without adaptation, and points out that wooden columns should not be Greek in proportion, but "just so large as is needful for the purpose for which they were erected."

Ward does not base his ideas on "Nature" to the extent that Emerson does, but examples from Nature are cited to support them.

"Architecture is a tendency to organization. . . . in natural organizations as the tree or the animal, we see no part that has not a meaning and use, and each part of that material which answers to its end. This also is a fundamental law of architecture."

Another life-long friend of Emerson was James Elliot Cabot. He was also a contributor to the *Dial,* and practiced architecture for a time (he had a part in the design of the Boston Athenaeum). He eventually became Emerson's literary executor. He wrote several articles on domestic architecture for early issues of the *Atlantic Monthly* which found favor with Emerson, as Cabot was also thinking along functional lines.

In his "Notes on Domestic Architecture,"[17] published in 1858, he takes note of the prevailing confusion, which he attributes to attempts to beautify houses deliberately. These attempts are destined to fail, for they ignore the "two-fold requirement of fitness for its use and of harmony with its surroundings."

"For a house is not a monument, that it should draw attention to itself, — but the dwelling-place of men upon the earth; and it must show itself to be wholly secondary to its purpose."

He notes that Americans are more likely to be successful when building a pig sty or a log house than they are when attempting to import "styles," an effort which is bound to fail because not based on real need.

"What is wanted for any real progress is . . . more thoughtful consideration on the part of house-owners of what truly interests them in the house. . . . What is it that we really care for in the building of our houses? Is it not, that, like dress, or manners, they should facilitate, and not impede the business of life? . . . They are to be lived in, not looked at; and their beauty must grow . . . naturally from their use. . . ."

Cabot amplified his position in an *Atlantic* article in 1862.[18]

"Because our architecture is bad, and because the architecture of our forefathers in the Middle Ages was good, Mr. Ruskin and others seem to think there is no salvation for us until we build in the same spirit as they did."

But Cabot feels that this position is not a reasonable one, because his own age has needs and wants that the earlier people did not have.

"The only chance clearly is to cut away till we come to the solid ground of real, not fancied, requirement. As long as it is our whims, and not our necessities, that [we] build, it matters little how much pains we take, how learned and assiduous we are. I have no hope of any considerable

17. **Atlantic Monthly,** I (1858), 257-63.
18. **"House-Building," Atlantic Monthly,** X (1862), 423-31.

advantage from the abundant exhortation to frankness and genuineness in the use of materials, unless it lead first of all to a more frank and genuine consideration of the occasion for using the materials at all.

"The first step toward seemly building is to rectify the relation between the appearance and the uses of the building, — to give to each the weight that it really has with us, not what we fancy or are told it ought to have."

Cabot believes that the main character of a building should be determined by needs and use, and discusses practical considerations in planning, such as orientation, the number and size of rooms, and their purpose. Then,

"The position, the internal arrangement, and the material being determined upon, the next point is that the structure shall be as little of an eyesore as we can make it."

He commends old New England farmhouses for their lines and effectiveness in their environment, but an attempt to "revive" them would not be in accordance with the principles he advocates.

"In fact, were it possible, we could not do better for the outside than to take these old houses for our model. But here, as everywhere, we find the outside depends on the inside, and that what we most admire in them will conflict with the new requirements. . . . The later and more ambitious houses, such as were built in the neighborhood of Boston at the beginning of the century [e.g., Salem], come nearer to our wants; but they sacrifice too much to a cut-and-dried symmetry to be of much use to us. After that the way is downward through one set of absurdities after another. . . ."

What, then, is to be done? First of all, there must be no more "forgeries" of the styles of the past. Then, Cabot suggests, the safest rule to follow, is:

"not to be conspicuous, and, to that end, to respect the plain fundamental rules of statics, of good construction, of harmonious color, and to resist sacrificing any solid advantage to show. . . ."

In the *Atlantic* two years later, Cabot elaborated his attack upon Ruskin's theories, — an attack which had the admiring approval of Emerson.[19] But Emerson and his friends, although united in their opposition to the Gothic Revival, were unable to stop it. Their ideas, though linked with "Nature," seem actually rather to be derived from the Vitruvian concepts of *firmitas* and *utilitas*, and as such are outside the current of their own time. But much of what they wrote is in harmony with present day attitudes toward architecture, and the twentieth century reader is inclined to regret that these men were not more heeded by their contemporaries.

WASHINGTON, D. C.

19. See Emerson letter to Longfellow, quoted in **The Life of Henry Wadsworth Longfellow**, ed. Samuel Longfellow (Boston, 1891), III, 31. Cabot's article is "On the Relation of Art to Nature," **Atlantic Monthly**, XIII, 183-199, 313-329.

Complete List of Masters' Theses Written at Oberlin College Under the Guidance of Clarence Ward

The following summaries were submitted by the authors themselves. The guest-editors wish to acknowledge their thanks to the contributors for their co-operation and, particularly, for their willingness to keep their abstracts within the necessary limitations of space.

1920 Dorothy Birkmayr (Mrs. Charles N. Kirk): *Ancient Coinage.*

1923 Warren R. Laity (T): *The Origin and Development of the Flying Buttress.*

1924 Marguerite Bloomberg (Mrs. Lewis C. Greenwood): *The Development in the Pediment of the Greek Temple.*

1927 David M. Robb: *Some Conceptions of Hell in Medieval Art.*

1928 Nancy Houston (Mrs. Truman M. Crowell): See summary on page 22.

Lester D. Longman: *The History of Italian Cassoni.*

1931 Elizabeth Barrett (Mrs. Kenneth Gould): See summary on Page 23.

1932 George H. Jones: *A Development of the Gisant Effigy Tomb.*

Wallace S. Baldinger: *A Comparison of Human Figure Styles in the Illumination of Manuscripts from the Fourth to the Sixteenth Century.*

1933 Edward S. Peck, Jr.: See summary on Page 23.

1935 Margaret Fiske (Mrs. W. L. Hilliard): *French and English Manuscript Illumination in the 13th and 14th Centuries.*

Mona M. Vittur (Mrs. F. R. Eckford): *Forgery in Art.*

1936 Ellen H. E. Johnson: *Modern Painting and its Traditional Aspects.*

Joseph F. Cantieni: *Cast Iron as a Decorative Medium in America.*

1937 William H. Hezlep: *Hindu Temple Architecture.*

1938 Elsbeth Walther Schiag (Mrs. J. Yantes): *Elevations and Sections in Sculpture as Expressions of the Artist's Character.*

1939 Elizabeth R. Fitton: See summary on Page 24.

Margery Moodey Mayer: See summary on Page 25.

Charles P. Parkhurst, Jr.: See summary on Page 26.

Kathryn H. Robinson (Mrs. Donald Neilsen): *The Running Frieze in Greek Sculpture.*

1941 Paul B. Arnold: *The Technique of Tempera Painting.*

Marjorie Batson Plume: See summary on Page 27.

Christine J. Miller: *Life and Art at the Fujiwara Court of Heian.*

Margaret Stark Fitzsimmons: *The Theory and Technique of Linear Expression.*

Adele H. Brown: *The Development of the Theme of the Psychomachia in Medieval and Renaissance Art.*

1942 Shirley E. Moskowitz (Mrs. Jacob Gruber): *The Technique of Fresco Painting.*

Lillian Spelman Payton (Mrs. Paul L. Frank: *The Techniques of the Use of Gold in the History of Art.*

Lois A. Bingham: See summary on Page 28.

1943 Jeanette Ornstein (Mrs. L. B. Salwen): *Mexican and American Mural Painting (a Social Evaluation).*

Myron T. Palmer: *Etching Processes.*

1944 Louise S. Richards: *A Stylistic Analysis of Rembrandt's Landscape Etchings.*

Mary J. Anderson: *A Study of Drawings by French and American Painters from* 1850 *to* 1943.

Nancy Clay (Mrs. Arthur Dann): *A Study of Neo-Classic and Romantic Drawings as Exemplified by the Work of David and Ingres, Gericault and Delacroix.*

Robert E. Johnson: *A Foundation for the Study of Three-Dimensional Design in Painting.*

1945 Patricia A. Smith: See summary on Page 29.

Catherine O. Leuthold: *The Engravings of Lucas van Leyden.*

1946 Lester F. Pross: *The Relationship between Text, Design, and Illustration in Contemporary Bookmaking.*

Jean E. Milligan: *A Survey of Religious Painting in America.*

1947 Abbott L. Cummings: See summary on Page 30.

James E. Dew: *The Development of Landscape Painting in Wash and Water Color.*

Stela I. Dickerman: *Colonial Silver: Origin and Stylistic Development.*

Elizabeth F. Sims: *Leonardo's* LAST SUPPER: *its History and Criticism through the Ages.*

1948 Marian Card: See summary on Page 31.

Jean Reitsman France: See summary on Page 31.

Ellen D. Levin: *A History of the Illustration of American Children's Books.*

Summaries of Masters' Theses on topics from the history of architecture, written at Oberlin College under the guidance of Clarence Ward

The Tunnel Vault in Romanesque Architecture

By NANCY HOUSTON CROWELL (1928)

"The vault is the key to the architectural systems of the Middle Ages." The truth of this statement becomes immediately apparent when it is realized that the most pressing problem for the builders of the eleventh and twelfth centuries—the creation of a fireproof church — involved the use of the vault. In France, the problem was solved in Provence, Poitou, Bourgogne, and Auvergne by the employment of the tunnel vault, alone or in combination with the groined vault. Proof that the former was known at a much earlier date in the medieval period is furnished by the crypt-like church of St. Laurent at Grenoble. The early builders were unable, however, to use the vault to cover the nave of a large church.

In reality, a tunnel vault is a continuous arch, usually semicircular or pointed in section. It is the oldest type of vault which makes use of the true arch. Its weight and the continuous thrust which it exerts against the walls on which it is placed give rise to serious problems of buttressing and support. When a stone roof is incorporated into the structure, it tends to offset the lateral thrust to some extent by creating a resultant of forces which approaches more nearly the vertical. The most common method of solving the problem of buttressing was to construct salient buttresses along the exterior walls at points usually corresponding to members which divided the nave into bays.

Transverse arches springing from the piers also reinforce the vaults. In a three-aisled church the thrust of the aisle vaults offsets, to some extent, the thrust of the nave vaults and forces the resultant pressure downward, to be withstood by the walls and piers. Half tunnel vaults are frequently used over the side aisles in all the schools, and, in Auvergne, over the triforia. Often the transverse arches in the triforia are semicircular with a wall above, which fills in the space between them and the vaulted surface. These half tunnel vaults aid in buttressing the nave vault, for they relay the thrust to the outer walls and to the salient buttresses. In a few cases, chiefly in Provence, the three-quarter tunnel vault is used. These four types of tunnel vault (semicircular, pointed, half,

and three-quarter) are used in various combinations by the schools of Southern and Central France, with the exception of the school of Perigord.

The piers on which the arches and vaults of these Romanesque churches rest are built of masonry like the rest of the church. The compound pier is most often found; rectangular or square piers less frequently; circular piers semi occasionally.

Because of the thrust of the vaults the early builders of the period did not dare to cut windows in the wall. They feared the openings would weaken it. Hence the problem of lighting the church arose. In the early churches the windows were usually above the doorway, in the apse, and sometimes in the gable above the arch of the tribune. Later, workmen became more skilled in their craft and windows appear in each bay of the nave or side aisles. Finally, clerestories were built. The windows were widely splayed, admitting a reasonable amount of light without weakening the walls.

The main part of the thesis consists of a classification of churches in each of the schools of Provence, Poitou, Bourgogne and Auvergne, and the Loire. The general outline used for each region was as follows:

I. Historic and geographic background.
II. General characteristics of the school.
III. Classification:
  a. Single aisle churches. } Single story.
  b. Three aisled churches. }
  c. Three story churches.
  d. Transverse tunnel vaults.

SANDWICH, ILLINOIS

Romanesque Vaulting of France

By ELIZABETH BARRETT GOULD (1931)

Throughout France there are many Romanesque churches of the 11th and 12th centuries. Some of these have been thoroughly investigated and photographed. Ground plans, elevations and sections have been carefully drawn. The records of others exist only by name in the footnotes of books by de Lasteyrie, Porter and other medievalists. The subject of this thesis, a study of Romanesque vaulting, was undertaken for the purpose of completing the limited information now available on these structures In the comprehensive file index the name of every Romanesque church was given, including both location by town and province, and as complete a description as possible of the vaulting. In addition, a bibliography was compiled for each building. The Romanesque architectural schools and the location of the churches indexed were indicated on a large map. The index was to serve as a guide for further study, photography, and investigation of the various buildings.

WILSONVILLE, ALABAMA

Spanish-Indian Architecture in New Mexico

By EDWARD S. PECK, JR. (1933)

It is a significant fact that the Spanish colonizers of America, in contrast to the English, French and Dutch, produced the only architecture strongly modified by contact with the building methods of the native Indians. And nowhere was the fusion of Spanish and Indian so complete as in New Mexico.

The Pueblo nation of the upper Rio Grande had a distinguished tradition of architecture which stemmed from the "classic" period (Pueblo III, ca. 950-1200) in its monumentality and singular refinements. Such are visible in abandoned cities like Pueblo Bonito. Building crafts had deteriorated but not disappeared in the inhabited villages of Zuni, Taos, and Acoma. The regressive phase, Pueblo IV, proved adequate as a basis for the religious architecture of the Franciscans and their native converts.

For over two hundred years, Indians and priests constructed rectangular or cruciform churches which were an integral part of their surroundings. Thick, plastered walls and flat roofs of beams were stern and functional, and, but for their greater dimensions, Indian in appearance. On the other hand, the actual shape and internal arrangement of the Christian buildings were Spanish, as were perhaps innovations such as pre-cast adobe bricks, carved brackets under the great beams of the nave, frames about the doors, selenite in the windows, balconies between projecting buttresses on the facade, and towers or pierced gables for bells. Decoration and color were confined largely to the interiors, where the Renaissance and Baroque styles of far-away Spain were reinterpreted in Indian terms by Indian artists.

The bulk of this study consists of consideration

of fifty different sites. Photographs were taken of twenty-eight.

BOSTON, MASSACHUSETTS

The Church of Saint-Julien-le-Pauvre, Paris

By ELIZABETH R. FITTON (1939)

The monograph is divided into five sections, of which the second and third deal directly with the architecture.

I. HISTORICAL

This section deals with the site of the church in Paris, the history of its origin and development, and its place in the life of Paris. The problem resulting from the fact that there were three St. Juliens in Paris is presented and the arguments supporting the conclusion that Saint-Julien-le-Pauvre was formerly known as Saint-Julien-l'Hospitalier is adduced. Significant material from legends about the saint is included.

II. ARCHITECTURAL AND SCULPTURAL DESCRIPTION

This is a complete, detailed, explanatory description of all architectural and sculptural features of the building, interior and exterior, as they existed at the time of writing. A chronological summary of important architectural elements in the development of the present building is included, likewise a reconstruction of the original structure. The sources for conclusions are indicated.

III. THE PLACE OF SAINT-JULIEN-LE-PAUVRE IN ARCHITECTURAL HISTORY

Here the author discusses the styles and dates involved and makes interesting comparisons between Notre Dame de Paris and Saint-Julien-le-Pauvre, "La Petite Soeur de Notre Dame".

IV. MISCELLANEOUS

Monuments found in the church and other material not treated elsewhere.

V. BIBLIOGRAPHY

Points in the reconstruction fully discussed in part II of the monograph may be summarized as folows:

1. Only minor changes have been made in the east end of the present building.
2. Undoubtedly there were once three sex-partite vaults in the nave.
3. The nave arcades wre of pointed section, hence consistent with the style of the late twelfth century.
4. Cylindrical columns constituted the supports of the nave as at Notre Dame, with very little if any, alternation.
5. The central portion of the facade was flanked by simple buttresses which divided the front of the church. The central portal was pointed and a small, pointed window was used at the end of each side aisle. A small gallery ran across the facade, reached from the interior of the building by a small circular stairway contained within the right buttress of the facade. There is no proof that a rose window existed, but a simple one would seem probable and would have been in keeping with the thirteenth-century style of the facade.
6. The author agrees with Chardon's evidence for a triforium gallery.
7. A small *clocher* (with interior stairway), of the same period as the east end of the church, was built over that part of the Lady chapel which has the sex-partite vault.
8. The author also agrees with Chardon's evidence for an opening between the clocher and the triforium gallery.

In part III of the monograph the author finds that the dates of the present building range from that of the choir (1165) to the seventeenth century, when the present facade was built. The original church was completed by the early part of the thirteenth century.

Saint-Julien has the following similarities in common with Notre Dame, by which it was influenced.

1. Lack of transept (traced through Bourges to the non-projecting transepts of Notre-Dame).
2. Type and style of cylindrical nave columns.
3. Triforium arcade of Saint-Julien corresponded to tribune arcades of Notre Dame.
4. Use of sex-partite vaults in the nave and choir.
5. General character of the facade.
6. Inclusion of a sphinx capital. The one in Saint-Julien has smaller counterpart in ambulatory of Notre Dame.

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Domestic Architecture of the "Reign of Terror" in the United States

By MARGERY MOODEY MAYER (1939)

The buildings of the second half of the nineteenth century have been consistently ignored by writers of architectural history. Much has been written about the period in general, but while many of the treatises purport to deal with architecture, the literary and social aspects are given considerably more emphasis. Furthermore, writers deal with a few chosen styles, particularly the Gothic Revival. We have come to realize, however, that there were other styles of almost equal importance. The term "Gothic Revival" is no longer considered adequate to cover the entire period. It has, instead been broken up into its component styles and the name "Reign of Terror" applied to the whole. Such a picturesque phrase is highly appropriate to the most picturesque period in American architectural history.

A tabulation of the material found in contemporary publications shows that the "Reign of Terror" naturaly falls into three distinct phases. The first phase extends from 1844 until the time when all building was halted by the outbreak of the Civil War. Several styles developed almost simultaneously during this period and the builder's choice was simply a matter of taste or fancy.

Best known of the styles from this period was the Gothic Revival, of which the first examples appeared in this country soon after the Revolution. Gothic forms were employed sporadically during the years of the Greek Revival; their period of greatest popularity was from 1844 to 1859. The chief characteristics of the true Gothic Revival were the use of the pointed arch, either Tudor or lancet, hood mouldings over the windows, an irregular outline of mass, with high steep roofs, and Gothic detail in decoration. Contemporary with Gothic was the Italian Villa Style. Here is found a mass still complicated in outline but often symmetrical. A tower reminiscent of the Italian campanile was frequently used, as well as flat or low-pitched roofs with overhanging eaves, balustrades, round-headed windows, and more or less classical decorative motifs.

Also popular at this time were the so-called Decorated Styles, including Bracketed, Ornamental, Swiss, Norman and Oriental. The first two were the result of the invention of the jig-saw and showed the application of a profusion of nondescript ornament to a house usually Gothic in outline. In the first, prominent brackets under the eaves were the outstanding feature of decoration. The forms of the Swiss chalet were not inappropriate to life in this country, but the use of Norman or Oriental details was usually unsuccessful.

During the second phase of the "Reign of Terror" (ca. 1864 to 1876), the Franco-American was the most fashionable style. Its outstanding characteristic was the use of the mansard roof, usually combined with dormer windows. The outline of the building was generally symmetrical and details were classic, though often only vaguely so. A few houses were also built in what we call the Victorian Gothic Style to distinguish it from the earlier, purer form of Gothic. Victorian Gothic was still marked by the use of pointed arches, now always lancet in form, but the profuse details were borrowed from the various Decorated styles and the construction was obviously more flimsy.

By 1876 all of the early styles had spent themselves and a completely new manner of building arose. First came the Eastlake Style which was an outgrowth of Victorian Gothic with the addition of decorative details supposedly derived from the work of Charles Locke Eastlake in England. Eastlake was the most popular style from 1879 until 1885. Its chief characteristics were the use of a combination of materials, or wood in a variety of forms; a plan still more complicated than before, with the addition of small balconies, a small tower, and often several small porches. The ornament was still over-elaborate. It reveled in turned spindles and carved panels, which often replaced the earlier jig-saw work. Windows of colored glass were also popular.

Smallness and frequent shoddyness, characteristic of everything connected with the Eastlake Style, were relieved by the advent of the Romanesque Revival. This style became popular chiefly because of the influence of H. H. Richardson. It flourished from 1888 to 1894. Romanesque houses were massive in appearance and generally large. Wooden houses were usually shingled but were entirely free of exterior ornament. In buildings of brick or stone, Romanesque details of decoration were often used, but always with restraint.

The Queen Anne Style, which was popular at

about this same time (1889 to 1895), might well be called a combination of Eastlake ornament applied to a Romanesque plan. Decoration, which was often ornate, included the use of curved lines which were never found in Eastlake, while the plan almost always included a low tower or at least one rounded portion. The broader porches and massive outline were adapted from Romanesque; the use of colored glass windows shows further Eastlake influence.

The "Reign of Terror" closed with the so-called Colonial Revival which lasted from 1890 to 1897. Here we find the addition of Georgian architectural details to houses which were similar to the Queen Anne Style in mass. Classic columns to support the porch, oculi, Palladian and fan-shaped windows were characteristic.

It is hard to set a terminal date for the "Reign of Terror", for Colonial Revival houses were built throughout most of the first decade of the twentieth century. We may say that 1900 marks approximately the beginning of the modern era, a time when Eclecticism and Functionalism are still vying for supremacy.

NORTH KANSAS CITY, MO.

Santiago de Compostela and the Pilgrimage Road

By CHARLES P. PARKHURST, JR. (1939)

Through study of bibliographical and photographic material available to the author in 1938, this paper analyzes three related historical aspects of the cathedral of Santiago and the road leading to it.

I. Saint James and the Pilgrimage Road

The legends surrounding Saint James the Greater with relation to his presence in Spain, and in particular to the location of his burial place, emerged after the sixth century and led eventually to the miraculous revelation of his tomb in the year 813. The aims of Charlemagne and his Archbishop, Turpin, and of the crusade against the Moslems in Spain figure importantly in this rediscovery. Numerous published documents, in particular the so-called Codex of Pope Calixtus II and the *Historia Compostellana,* reveal through careful examination much of the subsequent history of the shrine, of the three successive churches, and of the town which grew up around them.

Four principal roads, converging in one common route which led across northern Spain, drew pilgrims from all Europe. The itineraries offered frequent hospices, a good number of which were established by the monks of Cluny for promotional as well as devotional reasons. A literature of guide books and written legends grew with the popularity of the road, which, in the twelfth century, counted itself more popular than the routes to Rome and Jerusalem.

II. The Architecture of Santiago

There were three successive churches at the tomb of Saint James: (1) in the ninth century, the tomb, plus a nave to accommodate pilgrims; (2) the first large church, probably built between 866 and 909, with later additions; and (3) the great Romanesque cathedral begun in 1078 and completed about a century later. Some of its builders are known by name and were probably of French origin. The chronology of the building campaigns is of great importance because it is linked to the problem of the origin of the "pilgrimage road" type of church, and to the question of which pilgrimage church was the earliest of the type. The evidence for chronology is based upon documents, inscriptions, structural analysis, accumulations of indirect evidence and the style of Santiago's sculptors. Except for a few secondary architectural elements, which are possibly of Spanish origin, the cathedral had a French prototype. Among extant monuments the most probable is St.-Etienne at Nevers.

III. The Sculpture of Santiago

In the sculpture, likewise, there are traces of native elements, but the study of the carvings is complicated by the present confused and conglomerate placing of those on the exterior. They are now collected on the south facade (Puerta de las Platerias). From the guide-book description of Aymery Picaud (1120; revised 1130-41?) we may conclude that the west portal was then incomplete, though in progress, and that it featured the Transfiguration. Probably it was not completed before being supplanted by the Glory Portal by Master Matteo sometime after 1160. On the northern facade was the Creation (modernized in the eighteenth century) and on the southern, the Passion. The sculpture of all three portals, fragments of which were set haphazardly into the Platerias facade at a later date, was begun in the atelier as

early as 1095, gradually assembled and to a large extent in place when it was noted by Aymery in 1120. Of the various sculptors who worked here, and at least seven hands are distinguishable, certain ones also worked at St.-Sernin, Toulouse, and at Ste.-Foi, Conques.

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[Of these sculptors, two worked at Conques after leaving Santiago, and one of the two carved at least one capital at Clermont-Ferrand. Another style, perhaps that of an entire atelier, reappears thereafter at Leon and at St.-Sernin. In general it appears, however, that the origins of the sculpture of the pilgrimage road as well as of the architecture, lay in France, but that the style was not realized fully in sculpture until the fervor of the pilgrimage, the strain of competition, and the effects of patronage and piety brought it to full flower at Santiago, whence it returned along the road and left its mark on twelfth-century France. (Author, 1948)]

PRINCETON UNIVERSITY

The Court of Federigo da Montefeltro, Duke of Urbino

By MARJORIE BATSON PLUME (1941)

Federigo da Montefeltro, the most illustrious of the rulers of Urbino, was by profession a successful condottierre. He ranked among the greatest of Italian captains. He was a scholar, a collector and patron of the arts. His success as a condottiere gave him the means to maintain a household of royal standards. About 1445-1450, feeling that the buildings at Urbino (built ca. 1350) were inadequate for his needs, he ordered the construction of a new palace. Two unconnected buildings were begun. They were not parallel to each other. It is not known whether these were ever completed for they were incorporated in the plans for an even more imposing structure which was designed for him by Luciano Laurana about 1465.

Due to the utilization of these earlier buildings, symmetry and the rectilinear quality of the Florentine palace was sacrificed. Either because of the insistence of Federigo, who collaborated with Luciano in the designing, or because of the strong traditions of the locality, characteristics of the medieval fortress were kept. Crenellations ornamented the top of the building. (The second story was added later.) The towers have machicolations at the top and a batter at the base. However, as was the manner of the early Renaissance, classic motives were imposed upon the medieval forms. The machicolations are classic consoles. Round-headed arches and entablatures decorate the pinnacles. But in spite of the necessary compromise, both in plan and in style, the architect has achieved beauty on the exterior and convenience and charm in the interior.

Many writers have spoken admiringly of the conveniences of the palace. Advantage was taken of the uneven terrain to build great, vaulted rooms in the substructure which were utilized as stables, kitchens, cisterns and baths. Spiral and straight staricases were numerous, in addition to the grand staircase. The corridor which runs around the courtyard on the first floor permits access to the various rooms without the necessity of going through any of the others.

Since it is impossible to describe all the rooms of the palace, attention will be centered on the main courtyard. Here are no longer any medieval traces. The design, with its arcades and vaulted porticos, resembles Florentine prototypes, but there has been a conscious attempt to achieve a harmony of proportion and to eliminate the weakness of the earlier designs. Instead of corner columns such as Michelozzo used in his design for the Medici-Rucellai Palace at Florence, at the end of each arcade, Luciano Laurana constructed a solid pier to which half columns are engaged. Two pilasters, one on each face of the pier, give apparent support to the entablature which separates the two storeys. This is the work of a man who has studied antique monuments and earlier examples of the Renaissance. Here he creates with assurance a design of striking proportion and structural unity.

When Federigo chose Luciano Laurana to be the architect of the palace, Michelozzo and Benedetto da Maiano, both older and both renowned as architects and artists, were still alive, and Giuliano da San Gallo and Bramante were already better known. Although Vasari does not mention Laurana, Giovanni Santi, in his *Rhymed Chronicle*, calls him "best of architects. . . ." In the year 1465 he was employed successively by the courts of Mantua, Pesaro, and Urbino. Luciano's importance among those of his profession may have been much greater than is realized at the present time.

Nothing is known of Luciano's training. However, there are indications that his style, previous to the work at Urbino, was modified somewhat by the personalities whom he met there. Piero della Francesca was probably at the court during Luciano's first year there. Doubtless Luciano had access to Piero's manuscript *De Prospectiva Pingendi,* which was presented to Federigo in the year 1478. He also seems to have had knowledge of the architectural works of Alberti, possibly through the paintings of Piero della Francesca, through personal contact in Mantua (1463), or through Alberti's treatise *De Re Aedificatoria,* which the writer intended to dedicate to Federigo.

There are two panels attributed to Luciano which show groups of buildings arranged in an ideal fashion. There is centralization and symmetry. Many of the buildings depicted therein influenced buildings in Rome designed by Bramante and Raphael. Circumstances permitted an unusual synthesis to take place. In Luciano a thorough knowledge of Roman monuments was combined with a native tendency to be simple and clear. Then was added the influence of Florentine architects. The final synthesis of these elements came about not in the palace at Urbino, but in the paintings to which we have referred. Through them it was transferred to Laurana's Urbinate pupils, who carried the message to Rome. Thus he aided in laying the foundations for the Roman (or High) Renaissance architecture.

BLOOMFIELD, N. J.

The Fortified Dwelling in France during the Middle Ages

By LOIS A. BINGHAM (1942)

The mediaeval fortified dwelling in France was the product of its age. Petty warfare, waged constantly during the feudal period by aggressive landowners and Norman pirates, made the need for military architecture paramount and gave rise ultimately to the development of the chateau.

The earliest forms of fortification appeared in Normandy at the end of the 9th century and were but reconstructions of ruined Roman forts. From Normandy the building of rude fortifications spread to Touraine, Poitou and England. The French chateau of the 11th and 12th centuries was in its embryonic state in the solid, bulky, Norman structures, one of the finest of which is Chateau Gaillard (built 1196-1198); but as this was the period of the Crusades and the occupation of the Holy Land, the greatest French strongholds were built in Palestine. Among the fortifications constructed in the Near East at this time were Krak des Chevaliers and Margot, both of which bear evidence that the Crusaders used as their models structures seen in this new land. Thousands of years before the Crusades, fortifications in the eastern Mediterranean had reached a high degree of perfection, as evidenced by such fortresses as Babylon, Mycenae and Tiryns, all dating between 2000 and 1200 B.C. Architecture for defense, highly developed by the Egyptians, Assyrians and Greeks, was preserved by the Byzantines, but not further developed, as evidenced by such fortresses as Constantinople; finally, the basic principles, and even details, of plan and structure were carried from Byzantium to the Western world by the Crusaders.

French strongholds of the 12th and 13th centuries, based on ancient models, reveal an effort to develop a scientific method of fortification. They possessed three lines of defense, the light advance works, composed of moat and escarpment, the enceinte, made up of the curtain and chemise battlemented-walls separated by the lists, and finally the keep, the zone of last and supreme resistance, the private stronghold of the lord. The keep, a mediaeval invention of Norman origin, was at first only a gloomy but strongly defensible refuge of rectangular form. However, by the 13th century the circular plan, like that used at Coucy (finished 1230), had been adopted because it offered no vulnerable corners to the battering ram. The circular keep resulted from the Crusaders' acquaintance with such round towers in the Holy Land as the Black Tower of Roumeli Hissar on the Bosphorus. In the fourteenth century feudalism discarded the great round keep in favor of a plan more easily divisible into rooms for residence: the square keep flanked with corner turrets (Vincennes, as rebuilt by Charles V). Only when feudal manners changed, when the lords and squires wanted homes less depressing and tomb-like, did the keep give up the tower form, which it had adopted in the twelfth centry, and assume the shape of a defended dwelling equipped with accommodations contributing to comfort and pleasure. With this the developed chateau came into being.

The chateau-fort, appearing at the end of the twelfth century, included all three lines of defense artfully combined into one vast unit; yet, at the same time, each could remain independent when the necessity arose. It reached its final form in the fourteenth century in the Ile-de-France and surrounding regions. Louis of France, Duke of Orleans (1371-1407) was the first to combine scientific defensive arrangements with the comforts of the baronial residence (Pierrefonds).

By the sixteenth century, since firearms were in general use, the feudal strongholds had lost their military value. Their bulk and architectural details for defense were efficacious only against the siegecraft common to the Middle Ages. Yet, though their strategic value was gone, they were not immediately abandoned. Their general plan persisted and features which had originally been of military importance became features of decoration in the age which followed. As society changed, as the feudal lords and barons under the new social system became more interested in indolent ease and the pleasures of the hunt than in the rigors of battle and the tedious siege, the fortified dwelling lost its importance. In its place came the chateau-de-plaisance, out of which grew the elaborate Renaissance palaces of the next era.

NATIONAL GALLERY OF ART

New England Meeting Houses and Churches

By PATRICIA ANNE SMITH (1945)

The Old Ship Meeting House, Hingham, Mass., 1681, is the only survivor of those square, two-story, hip-roofed wooden buildings which New England settlers built in the seventeenth century for public meetings and for services of worship. Hingham modernized its meeting house between 1730 and 1755 so that it would conform to the eighteenth-century pattern of an oblong mass with or without a stair-tower or a steeple at one or both ends and with the main entrance on the long side. In these "side-entrance" meeting houses the high wall pulpit, with steep stairs and a sounding board, was opposite the entrance, and there were galleries on three sides. Square box pews seated the congregation. This "side-entrance" plan, a forerunner of the nineteenth-century auditorium plan, was admirably suited both for town meetings and for non-conformist worship, which emphasized preaching rather than ritual. Such meeting houses stand at Amesbury, Mass., 1785; Millville, Mass., 1769; Walpole, Me., 1772; Rockingham, Vt., 1787; Farmington, Conn., 1771; Sandown, N. H., 1773; Newport, R. I. (Sabbatarian Meeting House), 1729; and at Boston, Mass., (Old South Meeting House), 1729.

The Anglican Church, which came to the colonies in the late seventeenth century as "The Society for the Propagation of the Gospel in Foreign Parts," preferred the "church" plan of longitudinal axis, with the entrance at one end, rather than on the side, and with the pulpit and altar at the opposite end. Christ Church, Boston, Mass., 1723, and its wooden counterpart, Trinity Church, Newport, R. I., 1726, are examples. The English Peter Harrison brought to the colonies an architecture of Palladian type derived from James Gibbs, and the decorative details of Harrison's King's Chapel, Boston, Mass., 1749-53, and Christ Church, Cambridge, Mass., 1761, have their origin in Gibbs' *Rules for Drawing*.

In the late eighteenth century non-conformist congregations began to build on the "church" plan, largely because of two Boston architects, Charles Bulfinch and Asher Benjamin. Bulfinch's Hollis Street Church, Boston, Mass., 1788, and his meeting houses in Pittsfield, 1790-93, and Taunton, Mass., 1789-94, as well as his later churches, were "churches" in plan. The Pittsfield and Taunton meeting houses were the source for the "Plan, Elevation and Section of a Meeting House" which Benjamin published in his *The Country Builder's Assistant* of 1797, the first of the American architectural handbooks, which was immensely popular in New England. Buildings derived from this design are at East Poultney, Vt., c. 1803; Bennington, Vt., 1805; Middlebury, Vt., 1809; Salisbury, Conn., 1798; Manchester, Mass., 1809; and Lenox, Mass., 1805.

The "church" plan was firmly established in the early nineteenth century. The tetrastyle portico was common, either prostyle, as at Center Church, New Haven, Conn., 1812-14, and Litchfield, Conn., 1828-29, or engaged, as at North Church, New Haven, Conn., 1812-17, Avon, Conn., 1818, and Hancock, N. H., 1820. The spire continued to be used, but with considerable competition from the cupola belfry. On the interiors slip

pews replaced the box pews, domed ceilings were frequent, and low pulpits, supported on columns, supplanted the high pulpits. The First Church, Lancaster, Mass., 1816, designed by Bulfinch, unaltered save for the addition of a parish house at the rear, and graced by a beautifully carved pulpit, is one of the most handsome of the early nineteenth century New England churches. The nineteenth century also brought to church design the revival styles, Greek, Egyptian, Gothic, which swept over Europe and the United States.

The buildings which New England colonists and citizens of the new republic built for the worship of God reflect the building methods and styles, as well as much of the society, of their time and merit the attention of every student of American civilization.

WHEATON COLLEGE

Domestic Architecture of the 17th Century in Massachusetts

By ABBOTT L. CUMMINGS (1947)

This study deals primarily with the origins and development of domestic architecture in Massachusetts in the seventeenth century. Actually, the subject has been extended to include a comprehensive survey of those earliest temporary shelters which were erected by the first colonists and which must be reconstructed entirely from the written record. It appears very clearly, however, that these makeshift "cottages" were supplanted almost immediately, and certainly wherever possible, by more substantial houses framed in the traditional English manner. The greater portion of the thesis is devoted to a study of these more conventional forms.

The primary sources of material have been of three varieties: contemporary documents — the diaries, letters, land records, probate records, and wherever possible the actual builders' agreements; written material of more recent date which might reveal a more thorough knowledge of the original condition of the architecture; and the houses themselves, revealed through photographs, plans, and measured drawings. In connection with the earliest houses it has been necessary again to rely for much of our information upon the written record, for portions of three houses only, the Fairbanks House in Dedham, the Whipple House in Ipswich, and the Balch House in Beverly, can be ascribed with any (and by no means a final) degree of certainty to the decade 1630-1640. On the basis of all this material, and particularly in terms of surviving monuments, an attempt has been made to trace the development of the house plan and the stylistic evolution of the house form itself, and to analyze thoroughly the structure and building techniques. A sufficient number of authentically dated monuments has survived to enable one to discern certain very marked evolutionary trends. The size and character of the chimney, the condition of the overhang (whether on one side or three), the size of certain structural units, together with the more general considerations of plan, roof pitch, and dimensions, were all found to have undergone a relatively fixed stylistic progression.

Two concluding chapters are devoted to a discussion of the more elaborate seventeenth-century dwelling, often distinguished by the use of a "finished" third story and facade gables, and to a study of the brick and stone house in the seventeenth century. The latter form has survived in so few numbers that one is led to the conclusion, supported by early documents, that the tradition of building in brick and stone was never fully established in this early period.

The fundamental purposes of the study have been those of technical analysis and detailed reconstruction of the seventeenth-century house form in Massachusetts. Modern photographs and drawings of plans, elevations, and details have been introduced to clarify and illustrate the first of these purposes, while in the case of the second an attempt has been made wherever possible to draw upon illustrative material as nearly contemporary as possible with the actual monuments. Few areas in the country present as great a wealth of documentary material and as representative a group of well preserved houses dating from the seventeenth century as does Massachusetts, providing the student with an ample index to the many and varied phases of its architectural history.

ANTIOCH COLLEGE

Early Church Architecture in New Jersey

By MARIAN CARD (1948)

New Jersey lies between Philadelphia and New England, and church building in the state until 1820 was influenced by both areas. The earliest houses of worship were usually square, hexagonal, or octagonal. The Dutch settlers especially liked to build polygonal churches. These were very simple, one-story buildings, with few, if any, seats and had a belfry in the center.

In the eighteenth century the meeting-house type was developed in stone, wood, and brick throughout the state. In these buildings the entrance was on one side, with the pulpit directly opposite. There might be galleries on one or three sides, and there were high square pews. The Old Tennent Presbyterian Church, built near Freehold in 1753, one of the most famous and most beloved churches in the state, is a fine example of this kind of building in wood. It was one of several churches used as a hospital during the Revolution. A typical example in stone may be seen in the Fairfield Presbyterian Church at Fairton, 1780, and in brick in the Pittsgrove Presbyterian Church at Daretown, 1767. A generous proportion of the building as a whole, simple cornices, and the wide paneling of the Central States characterize all these buildings.

Some more elaborate churches were erected in the larger towns after the Revolution. Those near Philadelphia retained the meeting-house form, but changed the interior arrangement so that the pulpit was at one end and added more elaborate doorways. Trinity Church in Swedesboro, 1784, the Presbyterian Church in Bridgeton, 1792, and the Cohansey Baptist Church at Roadstown, 1801, are the most important of these.

At the same time a group of churches was erected in and around Newark, influenced by those of New York and New England. These also had the pulpit at one end, but added a large tower and spire at the front. The Presbyterian churches at Elizabeth, 1786; Newark, 1791; and Bloomfield, 1796, are the principal examples in this group. These are all large, two-story buildings, built of brick or stone.

This same kind of building is found on a smaller and simpler scale in the Dutch Reformed churches of Bergen County. These are two-story stone buildings with central tower and spire. The old Bergen Church in New Jersey, 1773, is no longer standing. In the Reformed Church in Hackensack, 1791, are seen the fine stone work, modillioned cornice, and clapboard gable on the back common to all of this group. Early signs of the Gothic Revival are also seen in the pointed arches of the windows and doors. The buildings at Ridgefield, 1792; Dumont, 1801; Wyckoff, 1806; and Upper Saddle River, 1819, are other fine examples.

There are many Friends' Meeting Houses in the southeastern part of the state near the Delaware River. Even up to the present time the Friends have continued to build their houses of worship in the meeting-house style. The great charm of these buildings lies in simplicity and fine proportion. Most are built of brick, although there are a few built of wood and some fine examples in stone, such as the Meeting House at Mount Laurel, 1760. Again the influence of Pennsylvania and Delaware is apparent. The fine buildings at Salem, 1772, and Crosswicks, 1773, were probably inspired by the Meeting House at Buckingham, Pennsylvania, 1768.

Thus in the Georgian and Early Republican periods church building in New Jersey followed patterns set in both New England and the Central States, and it is apparent that New Jersey was in the line of communication between these two regions.

UPSALA COLLEGE

Early Church Architecture in the Western Reserve

By JEAN REITSMAN FRANCE (1948)

After the Revolution, when the newly united colonies were asked to give up their conflicting claims on territory west of the Alleghenies, one part of the Northwest Territory was "reserved" by Connecticut from her cession of western land. This Western Reserve, as it was called, was a strip of land, slightly larger in area than the state of Connecticut itself, situated in what is now the northeast and north-central portion of Ohio.

The first settlers of the Western Reserve, coming for the most part from Connecticut and nearby states, brought with them the cultural heritage of their New England homes. Their early churches, usually the first important buildings erected in new

settlements, present strong stylistic evidence of New England architectural ancestry.

The churches built before 1830 were examples of the Early Republican style then popular in New England. An outstanding example of this type is to be found in the Congregational Church at Tallmadge, Ohio, which shows close stylistic resemblances to the churches at Lyme and North Woodbury, Connecticut.

In the 1830's the Western Reserve church-builders showed a pronounced fondness for a combination of Early Republican and Gothic forms. Such a combination can be found in some New England country churches. It is probable that the erection of a few early churches in "pure" Gothic style also influenced Western Reserve. The Congregational Church at Atwater, Ohio, has Gothic windows that are reminiscent of Trinity Church in New Haven, Connecticut. These windows, however, are combined with a portico of attenuated Ionic columns and a Georgian spire close to James Gibbs' design for St. Clement Danes in London.

Most of these churches were built by carpenters with little previous training, working in what was then a wilderness. It is little wonder that many of these men referred frequently to carpenters' handbooks compiled by architects like Asher Benjamin of Boston. Details adapted from Benjamin's work are to be found in churches at Claridon, Rome, and Mecca, Ohio, among others. The facade of the Kinsman, Ohio, Congregational-Presbyterian Church comes from a plate in Benjamin's *American Builder's Companion,* and the design of the chapel of Western Reserve Academy at Hudson, Ohio, seems to have been influenced by other plates in the same book.

By the 1840's and early 1850's, when the popular architectural style was the Greek Revival, the Western Reserve had developed a few men worthy of the title of architect. One of these, Simeon Porter, can be credited with four churches which are outstanding examples of small church architecture. They are the churches at Brecksville, Twinsburg, Berlin Heights, and Streetsboro, Ohio.*

Interesting examples of the Greek Revival style may be found at Wadsworth, Freedom, North Olmsted, Castalia, Weymouth, Bristolville, Steuben, Seville, Gustavus, Gates Mills, Mechanicsville, Leroy, Pittsfield, and Camden. These churches, and many others, show the originality and charm which the builders were able to express within the framework of Greek forms.

Variations in detail made necessary by the use of brick as a building material may be found in the churches at Windham, Oberlin, and Strongsville. That at Oberlin is particularly interesting for its plan. The church was built for the noted evangelist, Charles Grandison Finney, who wanted the congregation seated around him. The original plan, later modified, provided for a pulpit in the center of the church with seats in a circular arrangement around it.

One church built on the Western Reserve combines all three major architectural styles of the period. Elements of Early Republican, Greek Revival, and Gothic Revival styles are all incorporated in the Mormon Temple at Kirtland, built by the Mormons under Joseph Smith, their prophet, who said that the design came to him by divine revelation. The building's plan, it is true, is unique, well adapted to its function as the first temple of the Mormon sect. Its rich detail, however, seems to owe a measure of revelation to Asher Benjamin.

Two Episcopal churches, at Peninsula and Lyme, Ohio, show a combination of Greek and Gothic detail, but in general the Gothic Revival lay dormant between the time it was used in the Early Republican churches and its overwhelming popularity after 1850. By that time, however, the builders of the Western Reserve had grown away from New England influences and the architecture of the Western Reserve was no longer a distinct entity.

PRINCETON, N. J.

*Church records at Brecksville give Porter's name as architect. The others follow in close stylistic sequence. Porter also built the Hudson Chapel and is the son of the builder of the Tallmadge Church.

BOOK REVIEWS

BLAKE, MARIAN ELIZABETH, *Ancient Roman Construction in Italy from the Prehistoric Period to Augustus. A Chronological Study Based in Part Upon the Material Accumulated by the Late Dr. Esther Boise Van Deman.* Carnegie Institution of Washington. Publication 570. Washington, D. C., 1947. Pp. 421, 57 pls.

As indicated in the subtitle, the book is, in a measure, the last will and testament of Miss E. B. Van Deman, who had devoted a lifetime of research to the study of Roman architecture. In accordance with Miss Van Deman's wishes, Miss Blake undertook the arduous task of organizing and writing the book, based on the vast collection of data and supplemented by Miss Blake's own field work. Its subject is of supreme importance for the understanding of the Roman contribution to architecture.

In the first chapter the author discusses the various types of evidence which may be used in dating, such as literary sources, inscriptions, the ancient plan of Rome (*Forma Urbis*), the representation of buildings on coins, and the internal evidence provided by the buildings themselves. She also considers the social and political factors which promoted Roman architecture outside of Rome — the colonies, the villas, the military and public construction.

The second chapter on Roman Building Materials covers the ground traversed before by Tenney Frank and others, but the author considers more buildings than any of the previous writers and writes with greater precision on the geological questions concerning the quarries. She also includes pozzolana, wood, metals and glass. We find here information on such interesting items as temples of bronze, the use of gold leaf, and the evidence for glass windows.

The next chapter on the Stone Walls in Italy is a veritable archaeological Baedeker, listing dozens of sites with historic stone walls. Each is briefly described and up-to-date references are given. A great asset is the inclusion of architecture in Sicily and Southern Italy. Miss Blake concludes that in the area influenced by the Etruscans the development of masonry went from irregular "Cyclopaean" through polygonal to squared-stone masonry. The earliest walls in the south which show Greek influence present a facing of blocks laid lengthwise with an earth-filled core. In the late fifth century headers are employed to bond the two faces. Alternating rows of headers and stretchers are not found until the late fourth century B.C. Squared-stone construction was always in evidence after Greek colonization. By way of contrast, Cyclopaean and polygonal masonry were prevalent in Central Italy until a relatively late date.

The fourth chapter deals with squared-stone construction in Rome and its vicinity from the period of the Kings to the time of Augustus. Miss Blake is skeptical about all the cisterns and sewers often attributed to the Regal period. The podium and substructures of the temple of Jupiter Capitolinus are almost the only constructions left unchallenged. But surely it is carrying skepticism too far, if we deny as good evidence the sherds found in the stucco lining and the packing of a cistern — in this case sherds of the fifth and sixth century B.C. More than one hundred structures including houses and tombs are discussed in this chapter, all with up-to-date information. Only the account of the temple of Jupiter may have to be revised in the light of the revolutionary evidence concerning the arrangement of the sculptural decoration as provided by excavations in Veii. There apparently the famous groups of the Apollo temple were arranged along the ridge beam; the Capitoline temple had probably the same scheme. The concluding pages of the chapter contain valuable information about the treatment of blocks, tools, preliminary and marginal drafting, clamps, and mason's marks.

The fifth chapter, covering the arch and vault construction, is in the nature of a sketch, yet worth reading for its descriptive notes on individual structures. There is more novelty in the discussion of bridges and arcades. The author dates the earliest examples of voussoir arches in Rome in

the fourth century B. C. (drain in front of the temple of Saturn), leaves open a possible date of 268 B.C. for arched bridges on the Via Appia, and believes that the lintel arch was popularized by Sulla. The earliest cross vault is said to be that of the Porta San Lorenzo, Aquino, of 41 B.C. To the discussion of Etruscan arches should be added the material discussed by Akerstrom, *Studien uber die etruskischen Graber,* 1934, p. 16, and by the reviewer in this *Journal* II, 1, pp. 8 ff. The author dates the corbelled arches in the cemetery of the Crocefisso del Tufo, Orvieto, in the fourth century B.C.: this is too late, as is proved by the vases found in the tombs. Cf. C. Becatti, *Corpus Vasorum Antiquorum,* Italia, Musei Communali Umbri.

Chapters VI, IX, and X are devoted to the great Roman contribution of concrete construction. Taking Pompeii as her starting point, Miss Blake follows Carrington in the assumption that the use of concrete walls developed from the use of walls with cores held together by mud or clay, as in the Pompeian "Carpentry Style" of the fourth and third century B.C. Late in the third century, mud and clay were replaced by firm mortar. These Pompeian walls, then, were in principle early examples of the Vitruvian *opus incertum.* The author accepts the podium of the restored temple of Concord (121 B.C.) as the earliest instance in Rome. Following Boethius, she rejects Gatti's date of 193 B.C. for the Porticus Aemilia in the Emporium. The use of a facing of roughly rectangular stones (*opus quasi-reticulatum*) is placed in the time of Sulla (c. 90 B.C.), and the vogue of reticulate facing from 60 B.C. on. The survey of types of facing is extraordinarily comprehensive, a veritable dictionary of late Republican and Augustan structures in and out of Rome. The discussions are as valuable for questions of identification as for structural chronology.

The vital step toward architecture in concrete was the development through experimentation of an almost perfect mortar. This development is thoroughly discussed in the ninth chapter. Miss Blake assumes the progression from clay, to pure lime, to lime plus sand, to lime plus pozzolana. The use of sand mixed with clay came from Greece: the author instances a water conduit at Olympia (*Ol.* II, 175) and the fountain of Glance in Corinth (*AJA* 1910, 26), as well as the linings of Sicilian aqueducts at Taormina and Syracuse. In any case, the Greek use of mortar was largely restricted to surfaces exposed to the action of water. It may yet be worth investigating whether at least in Sicily the lime mortar may not have been introduced by the Phoenicians. Albright suggests that cisterns lined with lime plaster were widely used by them in the early Iron Age.* The decisive step was, after a fashion, accidental. "It was a fortunate accident that the sand of so much of Italy was pozzolana with hydraulic qualities which produced a concrete that could bear indefinite(?) loads". Historically, the experimental phase, in which the mortar is gray and friable, extended from the early second century B.C. to the time of Caesar. Among the early examples are the Porticus Aemilia of the Emporium and the city wall of Pompeii (c. 100 B.C.) in its fourth phase. A superior mortar resulted from the employment under Caesar of the local Roman red pozzolana.

Drawing on the evidence of modern building practice, Miss Blake points out that the Romans had no real insight into the scientific principles involved in the maturing of mortar, but obtained their results largely by trial and error. Nevertheless, on this purely empirical basis they were able to evolve sound and diversified procedures for the grading of sand and limestone and for the slaking of lime, as Miss Blake shows in an interesting discussion of the specifications given by Cato, Vitruvius, and Pliny.

Having thus discussed the facing and the mortar, the author reviews in her tenth chapter the history of concrete in general. She considers its forerunners in Greece and Italy, such as the mixtures of broken stones, mud, clay, or lime, used to fill the space between two stone walls; the walls in Africa and Spain made of moulded earth and gravel (*pise*); and the "quasi" or "pseudo" concrete of roughly broken stones held together by a weak mortar of lime and sand as employed in Sicily, Magna Graecia, Pompeii, and Central Italy. She concludes that the rise of true concrete "was the result of a long period of development, an

*ACLS, Conf. of Secretaries, Studies in the Hist. of Culture, W. Leland, 1942, p. 33, "Thanks to the then recent discovery of the uses to which plaster with slaked lime could be put, the Phoenicians were able to dig cisterns everywhere and to line them with true lime plaster impervious to water." "In coming centuries it would make it possible for the Phoenicians to colonize waterless islands all over the Mediterranean."

almost imperceptible growth." Cato (232-147 B.C.) has apparently the earliest reference in literature. "The role of concrete was not assured until the preparation of dusky red pozzolana concrete in Augustan times."

The remainder of the chapter is devoted to a detailed documentation of these propositions. We note some of the important points. Road beds may have been among the earliest structures made of concrete. Sulla's contribution lay in the mastery of vaulting rather than in any improvement in the quality of concrete. The theatre of Pompey (55 B.C.) provides a dated example for the transition from the ash-grey to the dusky red type of mortar. The differentiation of stone used in the aggregation according to the amount of pressure to be withstood begins hesitantly in the time of Caesar, but was still in its infancy under Augustus. The bonding of core and surface goes back to *opus incertum* and was improved in Augustan reticulate, but the bonding with triangular bricks was yet to come. Bonding courses of brick, too, are a post-Augustan development.

A summary of Augustan practices gives a clear picture of what had been achieved. Massive concrete construction became habitual for foundations, podia, retaining walls, and vaults, yet even in foundations the parts bearing the greatest weight were still made of stone. Free-standing walls of public structures, too, were made of stone, but in private buildings concrete faced with reticulate or with broken tiles was frequently employed. The aggregate stones of walls were laid in somewhat regular rows, and layers of marble or travertine chips were used to mark the stages in the construction of the wall. Concrete vaults were built over wooden centering, but the addition of stone centering was still considered desirable. The vaults were relatively narrow in span. To the previously developed barrel vault, cross vault, and cloister vault were added the first half-domes and domes, but no domes over square rooms are known from the Augustan period. No attempt was made to use ribs or to reinforce the lines of intersection in cross vaults, but the builders had begun to use larger pieces of light stone in the concrete of the vaults. The use of vases to lighten the weight of the vault is already attested in Pompeii.

The seventh and the eighth chapters deal with brick work. Here again Miss Blake provides a most helpful collection of scattered material. In her discussion of the literary sources she suggests that *later* and *latericius* are used by all pre-Augustan writers in the sense of "sun-dried brick," and that it was from a city of mud-brick that Augustus converted Rome into a city of marble. She surveys the surprisingly scanty archaeological evidence for sun-dried bricks in Italy (attested for the Tuscan sites of Vetulonia and Castiglione) and discusses in detail the famous wall at Arezzo, which consisted of half-baked bricks. Such bricks were also found at Veii and Bevagna. Only one example of the use of sun-dried brick has been observed in Rome (the Comitium), but its employment is abundantly attested by literary sources.

Baked brick was used from the fifth century on in Sicily and Southern Italy. In Northern Italy, the use of burned brick is attested in the first century B.C. The walls of Urbisaglia, Aquileia, Velleia, and Alba Pompeia are still Republican; those of Turin, Aosta, and Verona are Augustan. Much of Augustan Rome was built with the aid of mortar walls faced with trapezoidal bricks made from tiles. This peculiar practice, which prevailed until the time of Nero, was an outgrowth of the earlier stone-faced *opus reticulatum*. It appears chiefly in Roman tombs, all of which are duly catalogued.

Finally, Miss Blake considers the brickyards which may have been put under contribution for Roman buildings, and discusses those brickstamps which may be claimed as Republican or Augustan. The earliest dated stamp in Italy comes from Velleia (76 B.C.); the earliest found in Rome and Ostia date from c. 30 B.C.

Out of this wealth of individual investigations there emerges a rich and instructive picture of Roman construction in the Augustan Age, a picture which may be said to have two major aspects. In architecture as in politics the Romans of that age invented, developed, and codified techniques which were to make possible the development of Imperial architecture; but, at the same time — and this is something which needs to be recalled — the Augustan architects retained much that was traditional, tentative, or even primitive. The great period of colossal engineering feats in brick and concrete was yet to come.

In the preceding pages the reviewer has attempted to indicate some aspects of the extensive

information brought together in Miss Blake's book, yet he has done only imperfect justice to the variety of subject matter, which makes this book a veritable encyclopedia. As a cautious and up-to-date appraisal of available evidence, it will help to open the eyes of those to whom the ultimate truths on Roman architecture repose in Banister Fletcher, or Anderson, Spiers and Ashby; as a comprehensive collection of descriptive data, it will facilitate the labors of the specialist. Yet the book has obvious shortcomings. It is sound on technical procedure but lacks clarity in major problems of construction — a book on walls rather than structures. It is a book on architecture without architectural drawings, a disadvantage for which the valuable photographs cannot offer sufficient remedy. Its method is akin to a dictionary of the type of Platner-Ashby without the convenience of the arrangement of the latter. In matters of dating the author is not only cautious but at times diffident to the extent of refusing to draw conclusions from her own material; and occasionally the mass of detailed description obliterates the general line of argument. With intentional renunciation she refrains from entering upon the larger historical issues of origins and influences in Roman architecture as soon as they pass beyond the technical consideration of the walls. For these the readers will have to look to the forthcoming work of Axel Boethius (cf. his brilliant articles on "Three Roman Contributions to World Architecture" in *Festskrift J. Arvid Hedvall,* 1948; on "Roman and Greek Town Architecture" in *Goteborgs hogskolas arsskrift,* 1948; and on "Vitruvius and the Roman Architecture of his Age," in *Dragma M. P. Nilsson,* 1939). But when all is said and done, Miss Blake has written and the Carnegie Institution has worthily published a book of permanent value and monumental scope, a work that will serve many generations of scholars and will provide a new foundation for the study of Roman architecture. This is an occurrence sufficiently rare to command our respect and gratitude, to the great archaeologist who initiated the undertaking, and to the author who so courageously carried it to completion.

George M. A. Hanfmann
Harvard University.

OBERLIN COLLEGE SYMPOSIUM ON MEDIEVAL ARCHITECTURE

The Symposium on Medieval Architecture which provided the major material for this issue of the JOURNAL was held at Oberlin College on October 15-16, 1948. It was organized by the Art Department of Oberlin College as a tribute to the distinguished service of Dr. Clarence Ward, whose exceptional accomplishment is suggested in the dedication of this issue.

In addition to the reports printed in this issue, two other stimulating papers were presented which could not be printed. These were:

The Church Scheme with two Axial Towers by Kenneth Conant, Harvard University.

Justinian's Church of the Holy Apostles: A Reconstruction of Architecture by Means of Texts by Paul Underwood, Dumbarton Oaks.

An equally enjoyable part of the Symposium was the excellent presentation of Medieval Miracle Plays by the Oberlin Dramatic Association under the direction of Professor J. Stanton McLaughlin.

THE CONTRIBUTORS

ROBERT L. VAN NICE is a graduate in architecture of the Massachusetts Institute of Technology. His work on Hagia Sophia in association with Dr. William Emerson began in the late 1930's and is continuing after the interruption caused by the war.

CARL K. HERSEY is Head of the Department of Art and Archaeology at the University of Rochester. He is known for his earlier study of the Salamantine domes as well as for his work on Saint-Martin at Tours.

SUMNER MCK. CROSBY is Head of the Department of History of Art in the Division of the Arts at Yale University. His work at Saint-Denis was likewise interrupted by the war. Its resumption is good news to all interested in medieval architecture.

ROBERT B. SHAFFER is a graduate of Oberlin in 1928. He has substantially completed his doctoral study at Harvard and is now engaged in government service in Washington.

PROJECTS IN PROGRESS

Carroll Meeks of Yale University is gathering material on Henry Austin, 1804-1891, architect of New Haven. He will appreciate any information about Austin but especially letters, drawings, and attributed works outside of New England.

Walter Creese of the University of Louisville is working on American Architecture from 1918 to 1933 with special emphasis upon European influence. This will be an attempt to reinterpret the first post-war period by means of the foreign influence accepted and absorbed in the United States.

Abdul Kader Mohsin of the University of Oregon School of Architecture and Allied Arts is investigating the "Planning of Agricultural Communities for the Nile Valley."

Louise Hall of Duke University is at work on a study of "John McComb, Jr. and His Circle" and will appreciate any material on this subject.

NEWS ITEMS

Congratulations to SAH member Dean Leopold Arnaud of Columiba University, on his recent induction into the French Legion of Honor. The honor was conferred by Ludovic Chancel, Consul-General in New York.

Buford Pickens, whose article on "Regional Aspects of Early Louisiana Architecture" appeared in the last issue of the JOURNAL, reports that the lifetime collection of books, drawings, and plans of James Gallier, prominent New Orleans architect of the mid-nineteenth century, has been presented to Tulane University School of Architecture by Sylvester W. Labrot, Jr. of New Orleans. This will form a nucleus of the large collection of material dealing with the architecture of the Louisiana area which the school plans to establish.

CURRENT BIBLIOGRAPHY IN ARCHITECTURAL HISTORY

Due to limitations of time it has not been possible to prepare the bibliography for this issue. It will be resumed in Volume VIII.

TO MEMBERS OF THE SOCIETY OF ARCHITECTURAL HISTORIANS

Dear Colleague:

With this issue a brief statement of the present status of the Society and its publication is due you. A meeting of the officers and directors of the Society was held in New York on February 1, 1947. At this meeting it was voted: (1) to drop the word "American" from the name of the Society; (2) to approve the steps toward incorporation taken by the officers; (3) to retain the present officers and directors until the next annual meeting of the Society; (4) to form or reactivate committees on Research, Microfilm, Preservation, Publications, Ways and Means, Annual Meeting; (5) to make arrangements for corresponding and honorary memberships; (6) to make the Sterling Library the depository for publications received by the Society; (7) to designate the Avery Library as the probable center for microfilm activities; (8) to increase the dues of individual annual members to $5.00 a year.

In view of the difficulties encountered by the Society during the war years the publication schedule of the Journal was reconsidered. Although increased costs of publication make it impossible for the Society to be as generous as it would like to be, the following arrangements are to be made:

All former members of the Society will receive volume 5.

Continuing individual members may renew their membership for 1947, and prospective members may join the Society for 1947, at $3.00 if paid before July 1, 1947. After July 1, 1947 individual membership will be $5.00. Institutional, contributing and patron memberships may be renewed at former fees.

It is hoped that many members will elect the category of contributing ($10.00) or patron ($25.00) memberships and that all members will send to the Secretary, Editor or other officer the names of friends or acquaintances who might be interested in the activities and publications of the Society.